6. Descriptions of new Species of Phytophagous Coleoptera of the Genera *Homophæta*, *Asphæra*, and *Oedionychis*.

By Martin Jacoby, F.E.S.

[Received May 13, 1905.]

(Plates XIV. & XV.*)

In the 'Proceedings' for 1894 (p. 609) I have given the descriptions of many species belonging to the group of bladder-clawed *Halticinæ*, which until then were simply Catalogue names as published by Clark. The number of further species which I have received since enables me to publish here a considerable addition to my former paper; where Clark's names have been retained for the same species I have stated this, but by far the greater portion of my species were not known to Clark. The genera *Oedionychis* and *Asphæra* as at present understood almost rival in species the Galerucid genus *Diabrotica*, and it is frequently very doubtful to which of the two genera a species should be referred. Von Harold has tried to point out the differences between *Oedionychis*, *Asphæra*, and the allied genera (Coleopterol. Hefte, xv. p. 91), and lays the principal stress on the more or less elongate first joint of the posterior tarsi in *Asphæra* in contradistinction to the corresponding very short joint in *Oedionychis*, which in most cases holds good, but in many instances there are intermediate degrees as well as in the more or less inflated claws, so that it is uncertain to which genus these species should be referred; these are, however, rather exceptional, and v. Harold's definition must be accepted for want of a better one. All the species described here are contained in my collection.

HOMOPHŒTA CLAVAREAUI, sp. n.

Black, a frontal spot and the clypeus flavous; thorax fulvous, impunctate; elytra nearly impunctate, fulvous, a broad transverse band at the base and another narrower one below the middle, black.

Length 9 millim.

Head black, very shining, with some punctures near the eyes the latter widely separated, with a flavous transverse spot at the intermediate space, frontal elevations narrow, likewise flavous as well as the clypeus; antennæ extending beyond the middle of the elytra, black, the first joint fulvous below, third and fourth joints equal; thorax twice as broad as long, the sides feebly rounded, with narrow thickened margins, the anterior angles strongly produced and thickened, the surface fulvous, impunctate, rather convex; scutellum black; elytra with narrow, reflexed margins, microscopically finely punctured, fulvous, with a rather broad basal band occupying about one-fourth of the length of the elytra, its posterior edge oblique, widest at the suture, another narrower

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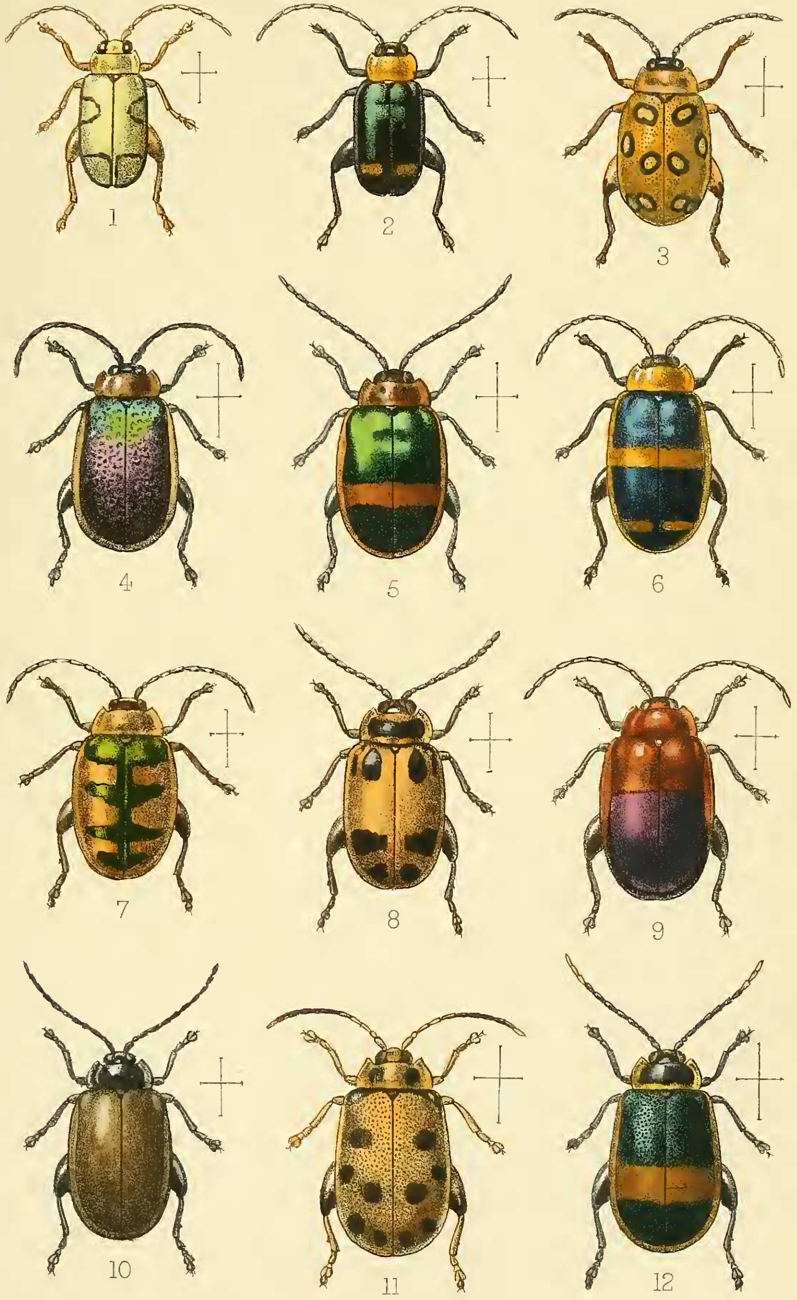
* For explanation of the Plates, see p. 460.

P.Z.S. 1905, vol. II. Pl. XIV.

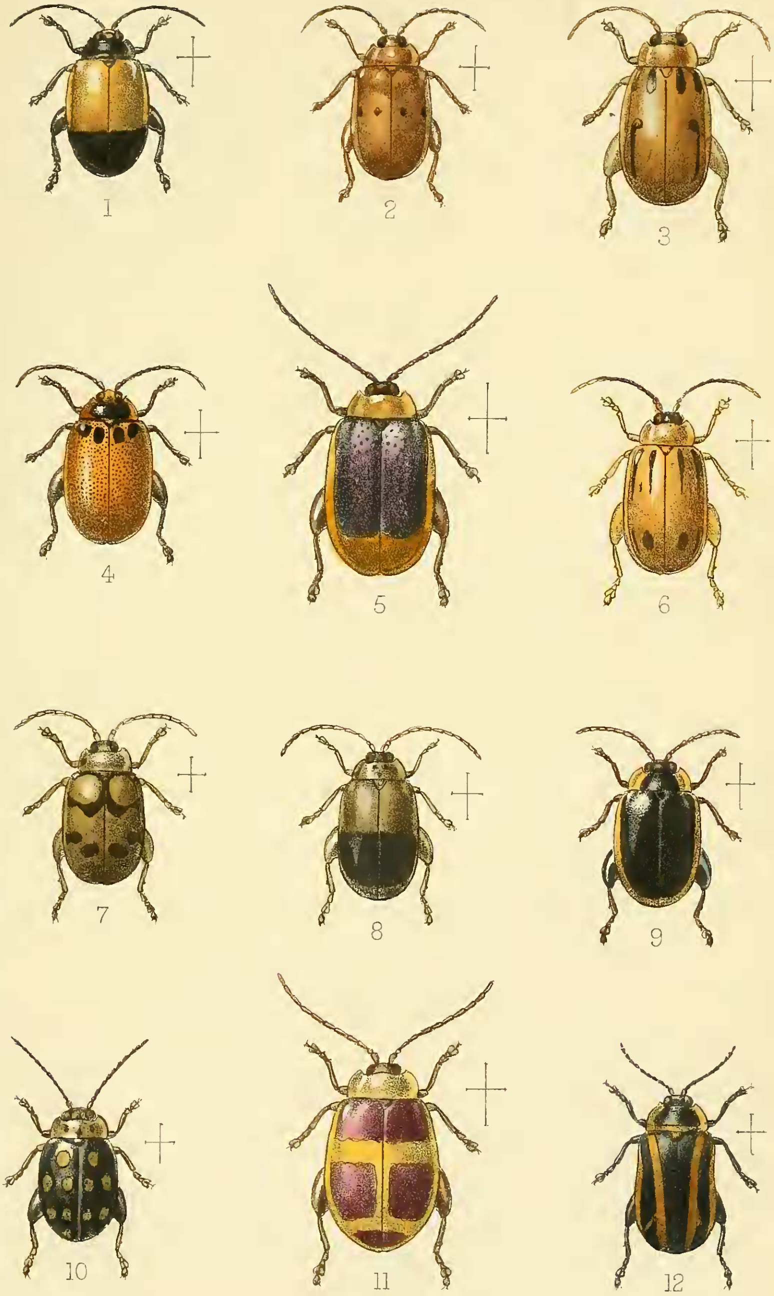


W. Purkiss del. et lith.

West, Newman imp.

NEW SPECIES OF BLADDER-CLAWED HALTICIDÆ.

P. Z. S. 1905, vol. II. Pl. XV.



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NEW SPECIES OF BLADDER-CLAWED HALTICIDÆ.

band below the middle, the sutural margin at the same place and the extreme apex likewise black, neither of the black bands extends to the lateral margins; under side and legs black; metatarsus elongate, claw-joint scarcely swollen.

Hab. Prov. Huallaga, Peru.

Of this species I received two specimens from M. Clavareau, of Brussels. In one of them the antennæ are shorter and the elytral black band at the base is straighter than in the other, otherwise there is no difference. The species is closely allied to *H. boliviana* Kirsch, but in that species the elytral bands are metallic or æneous in colour, they extend always to the lateral margins, and the latter as well as the epipleuræ are black, not fulvous, the posterior band also is wider than in the present insect.

HOMOPHŒTA PERUVIANA*, sp. n. (Plate XIV. fig. 2.)

Vertex of the head, antennæ, the breast and legs black; thorax fulvous, impunctate; elytra metallic blue, impunctate, with a narrow, transverse, flavous band near the apex; abdomen flavous.

Length 7 millim.

Elongate and parallel, the head with a few punctures near the eyes, the vertex black, the intraocular space, the clypeus, and the labrum fulvous; antennæ very long, extending below the middle of the elytra, black, the lower three joints more or less fulvous below, third and following joints very nearly equal; thorax twice as broad as long, the lateral margins straight at the base, widened towards the apex, the sides strongly thickened and deeply sulcate, the anterior angles greatly produced, the surface impunctate, fulvous; scutellum black; elytra with a deep depression below the base, impunctate, bright metallic green, with a narrow yellowish-white transverse band near the apex, not quite extending to either margin; legs black, the base of the femora often flavous; the breast black; the metatarsus elongate; claw-joints scarcely thickened.

Hab. Pachitea, Peru (*Dr. Staudinger*).

This is a handsome and typical *Homophœta*, unlike any other species of the genus; the characteristic fulvous spot between the antennæ and the shape of the thorax agree entirely with its allies. I have received several specimens from Dr. Staudinger and Herr Bang-Haas.

Genus ASPHÆRA.

Elytra pale coloured.

ASPHÆRA UNICOLOR, sp. n.

Subdepressed, testaceous, antennæ and legs slightly darker; thorax short, the anterior angles mucronate, anterior margin deeply concave: elytra minutely and closely punctured.

Length 7 millim.

Of rather flattened, scarcely posteriorly widened shape; the head impunctate, frontal tubercles rather broad, clypeus short and ridge-shaped; eyes widely separated, comparatively small; antennæ pale fulvous, the third and following joints elongate and equal, terminal joints rather shorter; thorax slightly narrowed anteriorly, the sides broadly flattened, the margins scarcely rounded, the anterior angles outwardly produced into a distinct and rather large tooth, the surface entirely impunctate; elytra with anteriorly rather broadly reflexed, lateral margins, without basal depression, very finely and closely punctured; under side and legs rather darker than the upper surface, the metatarsus as long as the following two joints together, claw-joint strongly swollen.

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* For the descriptions of two other new species of *Homophœta*, inadvertently omitted from this paper, see *infrà* p. 591.

Hab. Brazil.

Of this species, which may be known by the rather flattened general shape, the short thorax with its broadly flattened sides, and the entirely unicolorous upper and under sides, three specimens are contained in my collection without special locality.

Asphæra femorata, sp. n.

Testaceous, the head and the breast piceous or black; thorax nearly white, impunctate; elytra obscure testaceous, nearly impunctate; posterior femora with a large white patch.

Length 6–7 millim.

Head with a few deep punctures near the eyes, the vertex nearly black, the lower portion testaceous; eyes large; antennæ obscure fulvous or fuscous, the joints rather robust, the third slightly shorter than the fourth; thorax with the lateral margins obliquely narrowed anteriorly, feebly rounded, the anterior angles thickened and pointed but not dentiform, the anterior margin straight at the middle, the sides gradually flattened, the disc impunctate, yellowish-white, the sides sometimes stained with testaceous; scutellum piceous; elytra with a distinct basal depression, extremely minutely punctured when seen under a strong lens, obscure testaceous, the extreme sutural margins piceous; under side and the legs piceous, abdomen testaceous, the posterior femora with a large yellowish-white oblong patch at the outer portion, claw-joint moderately swollen.

Hab. Pichinché, Colombia.

A species not difficult to distinguish on account of the colour of the thorax and of the posterior femora; there are five specimens, before me, which show no variation in this respect.

Asphæra discicollis, sp. n.

Black; thorax with broad sides, the latter testaceous, the disc black, impunctate, anterior angles pointed; elytra convex, widened posteriorly, impunctate, testaceous; breast, the legs, and the middle of the abdomen black, sides of the latter testaceous; posterior femora but moderately thickened.

Length 8 millim.

Of convex, posteriorly widened shape; the head black, impunctate, frontal elevations broad, feebly raised, clypeus broad and thick; eyes widely separated, not very prominent; antennæ long and slender, black, third and following joints very elongate, nearly equal; thorax about twice as broad as long, the sides widened, the lateral margins strongly rounded, the anterior angles strongly produced and pointed, the surface impunctate, the lateral sulci broad but shallow, testaceous, the middle of the disc black; scutellum black; elytra with strongly reflexed lateral margins, the posterior portion convex and widened, the surface impunctate, testaceous; posterior femora less thickened than usual, the metatarsus very elongate; claw-joint scarcely, if at all, swollen; prosternum very narrow.

Hab. Bogota.

This *Asphæra* differs in more than one respect from the other members of the genus: the slender antennæ, widened sides of the thorax, and the but moderately thickened posterior femora are not found in any other species, to my knowledge, and agree rather with the genus *Aspicela*, but the perfectly normal shape of the mesosternum prevents the insect from being included in that genus. I know of only a single specimen.

ASPHÆRA HILARIS, sp. n.

Entirely pale testaceous; eyes rather large, antennæ pale fulvous or testaceous, thorax with gradually flattened sides, elytra not perceptibly punctured, metatarsus of the posterior legs elongate, claws swollen.

Length 7–8 millim.

Head impunctate, testaceous, shining; the eyes proportionately closely approached and rather large; antennæ extending to the middle of the elytra, obscure fulvous; thorax with feebly rounded sides, slightly narrowed anteriorly, the anterior margin concave, anterior angles thickened but only very slightly produced, the sides gradually flattened, the disc impunctate; elytra with a very shallow depression below the base, with broadly reflexed lateral margins, the surface entirely impunctate, shining; under side coloured as the upper surface, legs slightly darker; the metatarsus of the posterior legs nearly as long as the following joints together, claw-joints distinctly swollen.

Hab. Espirito Santo, Brazil.

An apparently rather common species of unicolorous appearance, which may be known by the gradually flattened sides of the thorax and the more than usually thickened claws; the elongate metatarsus shows, however, the species to belong to *Asphæra*. *A. pallida* Jac. is a much larger and broader species, with a black head.

ASPHÆRA ALBIFRONS, sp. n.

Testaceous, the antennæ black (apical three joints sometimes pale), the breast piceous, the head whitish-testaceous, thorax with the anterior and posterior margins black at the middle, elytra finely punctured.

Length 7 millim.

Head entirely impunctate, very light testaceous; eyes well separated, moderately large, frontal elevations narrowly transverse; antennæ slender, black, the apical two joints sometimes pale, the third and fourth equal; thorax with broadly rounded and flattened sides, the sulci strongly marked, the disc impunctate, testaceous, with the anterior and posterior margins black at the middle, the anterior angles not mucronate but slightly produced; scutellum more or less fuscous; elytra rather convex, very closely and finely punctured; the breast, tibiæ, and tarsi more or less piceous; the metatarsus distinctly elongate, the claw-joint strongly swollen.

Hab. Bolivia.

This species may easily be mistaken for one of the varieties of *Oedionychis albipennis* Jac., but it is of a more convex shape, the eyes are much more widely separated, the intermediate space is very light-coloured and entirely impunctate, and the metatarsus of the posterior legs is distinctly more elongate.

ASPHÆRA TARSATA, sp. n. (Plate XIV. fig. 10.)

Head, antennæ, and thorax, under side and legs black; thorax with broadly flattened sides, impunctate; elytra obscure testaceous, finely and closely punctured; metatarsus of the posterior legs elongate and slender, claw-joint strongly swollen.

Length 8 millim.

Head impunctate, black, frontal tubercles very strongly developed, trigonate, carina convex; antennæ black, the lower three joints shining, the others pubescent, the intermediate joints slightly widened, third and fourth joints equal; thorax with strongly rounded and broadly flattened sides, anterior margins blunt and slightly produced outwards, more or less testaceous, the rest of the surface black; scutellum black; elytra convex, widened towards the middle, with broadly reflexed margins, the base without depression, closely, finely, but distinctly granulate-punctate; under side and legs black.

Hab. Peru.

The more than usual elongate and slender metatarsus and the strongly swollen claw-joint and system of coloration well distinguish this species, of which I possess a single specimen.

ASPHÆRA NASALIS, sp. n.

Black, the head and the sides of the thorax anteriorly pale testaceous, the anterior angles mucronate; elytra testaceous, finely and closely punctured; carina of the head very broad.

Length $7\frac{1}{2}$ millim.

Head pale testaceous, shining, impunctate; eyes widely separated, frontal elevations broadly oblique, carina very broad and convex; antennæ long and slender, black, third and fourth joints very elongate, equal; thorax more than twice as broad as long, the sides broadly flattened and rounded, the anterior angles mucronate, the surface impunctate, more or less black, the anterior angles broadly testaceous; scutellum black; elytra testaceous, finely and closely punctured; under side and legs black; the metatarsus as long as the following two joints together, claw-joint strongly inflated.

Hab. Peru.

Very closely allied in coloration to *A. tarsata*; but the head pale, the antennæ slender, without widened and pubescent joints, and the metatarsus much shorter. Of this species I possess three specimens. The species is also closely allied to *A. albifrons*, but is much larger, and the anterior angles of the thorax are mucronate, the under side and legs are black. From both species the broad and blunt carina will distinguish the present one; it is more pronounced than in any other species I am acquainted with.

ASPHÆRA AMABILIS, sp. n.

Black; thorax short, transverse, impunctate; elytra testaceous, extremely finely and closely punctured, the apical margins black.

Var. Elytra unicolorous testaceous.

Length 5 millim.

Of posteriorly slightly widened shape; the head black, shining, impunctate, the vertex sometimes marked with a testaceous spot, deeply transversely grooved between the eyes, the latter large; palpi testaceous; antennæ black, the third and fourth joints equal; thorax short and transverse, the lateral margins rounded, the sides broadly flattened, this portion well separated from the disc, the latter impunctate, black, shining, the anterior angles produced outwards into a small tooth; scutellum broad, black; elytra slightly wider at the base than the thorax, convex, gradually widened posteriorly and without basal depression, testaceous, extremely closely and finely punctured, the extreme apical margins black; under side and legs black, the metatarsus of the posterior legs as long as the following two joints together, claw-joint rather strongly swollen.

Hab. Peru.

The black head and thorax and the proportionately short shape of the latter well distinguish this species, of which I possess three specimens, two of which have the apex of the elytra black to a small extent and the vertex marked by a small testaceous spot; in the other specimen the spot and the black apex of the elytra are absent.

Elytra with metallic transverse bands.

ASPHÆRA CARILLOENSIS, sp. n.

Testaceous; the head, breast, and the legs black; antennæ long, fulvous; thorax impunctate, anterior angles bluntly produced; elytra nearly white, impunctate, a transverse band at the base and another narrower one, slightly oblique, metallic dark blue, both bands abbreviated at the sides.

Length 6 millim.

Head impunctate, black; eyes distant, frontal elevations oblique, rather broad; clypeus very narrow, strongly thickened, carina very convex; antennæ long and slender, fulvous, third and following joints slender, equal or nearly so; thorax about twice as broad as long, the lateral margins feebly rounded, the anterior angles bluntly produced, the lateral sulci deep and broad, the surface impunctate, pale flavous; scutellum triangular, black; elytra with narrow but strongly reflexed lateral margins, yellowish-white, with two transverse blue bands not extending to the lateral margins, the first extending to about one-third of the length of the elytra, with its posterior edge nearly straight, the second band below the middle, of only half the width and of obliquely downward direction; breast and legs black, abdomen testaceous; metatarsus elongate, claw-joint very moderately swollen.

Hab. Carillo, Costa Rica.

The black head, fulvous antennæ, and the shape of the elytral bands principally distinguish this *Asphæra*; the elytra have the basal portion rather distinctly raised, but the intrahumeral depression is but moderately deep. I have three exactly similar specimens before me.

From *A. nigrofasciata* Jac., likewise from Costa Rica, the present species may be separated by the fulvous colour of the antennæ, the blue, not black, elytral bands, the much more narrow, reflexed margins of the elytra, and the rather smaller general size and more widened shape.

Asphæra zonulata, sp. n. (Plate XIV. fig. 7.)

Black below, antennæ and legs more or less piceous, above flavous; thorax impunctate, the anterior angles produced; elytra very finely punctured, with four metallic green transverse bands, much widened towards the suture, which is likewise metallic green.

Length 7 millim.

Of medially widened shape; the head more or less piceous at the vertex, the lower portion fulvous; eyes moderately large, with a few punctures near their inner margins; clypeus in shape of a transverse ridge; antennæ nearly black, the third joint smaller than the fourth; thorax with strongly rounded lateral margins, the anterior angles produced into a small tooth, the sides broadly and deeply sulcate, the surface impunctate, flavous, obsoletely transversely grooved near the base; scutellum black; elytra convex, broadly margined, widest at the middle, very finely punctured throughout, flavous, with four bright green metallic bands, not extending to the margins—of these, the one at the base is the widest and has its posterior margin obliquely rounded, it extends as far as the shoulders, the second band at the middle is connected with the first along the suture by a rather broad stripe of green, its ends are greatly narrowed, the third band below the middle is of similar shape, but the fourth near the apex is of a shorter and broader form, the suture connects all these lower bands by a narrow metallic green stripe; metatarsus elongate, claw-joint strongly swollen.

Hab. Peru.

Different in the number and shape of its elytral bands from any other species; two exactly similar specimens are contained in my collection.

ASPHÆRA VERNALIS, sp. n.

Piceous, the lower part of the face and the thorax flavous, sides of the latter broadly flattened, disc impunctate; elytra flavous or pale fulvous, with two transverse violaceous bands, one at the base, the other below the middle, not extending to the sides or apex.

Length 6–6½ millim.

Head with a few punctures near the eyes; the vertex nearly black, the frontal tubercles and the clypeus flavous; antennæ piceous or black, the lower three joints obscure fulvous; thorax slightly narrowed anteriorly, the sides with a rather broad flattened margin, the anterior angles dentiform, the disc impunctate, yellowish-white; scutellum black; elytra impunctate, flavous, the basal transverse blue or violaceous band nearly extending to the middle, the lower band of equal width, not extending to the apex, both bands are limited laterally by the broadly reflexed lateral margins, the flavous band which separates the darker ones at the middle is of about half the width (in a longitudinal sense) than the blue bands; breast and legs piceous, the base of the femora rather lighter; abdomen flavous; claw-joint scarcely thickened.

Hab. Br. Guiana.

This is another species with transverse blue bands of which so many are known, yet there is none which agrees entirely with the present one. *A. æmula* Illig. is described as over 4½ lines in length, the thorax as having the sides obsoletely flattened, while in this species it is very distinctly marked; the colour of the head is given as testaceous and the median pale band as broad, while in *A. vernalis* this band is of only half the width of that of the dark bands These remarks also apply to *A. ornata* Illig. *A. curialis* Erichs. has the posterior band much narrower and the pale division broader; in *A. limitata* Har. the posterior blue band is still narrower, and there are other differences besides.

ASPHÆRA SEPARATA, sp. n.

Black; thorax fulvous, impunctate; elytra pale testaceous, impunctate, a broad transverse band at the base, not extending to the lateral margins, and another band at the apex, dark violaceous.

Length 6 millim.

Head black, shining, impunctate; eyes large, elongate, frontal elevations very broad but feebly raised, clypeus with an acute central ridge; antennæ black, the third and fourth joints equal, intermediate joint slightly widened; thorax with nearly straight sides, slightly narrowed anteriorly, anterior angles thickened and produced into a short point, the sides flattened but gradually so, without deep accompanying groove, the disc impunctate, fulvous or flavous, anterior margin rather deeply concave; scutellum black; elytra gradually and slightly widened posteriorly, with a short but rather deep sutural depression below the base, impunctate, pale testaceous, with two metallic dark purplish bands, the first subquadrate at the base, nearly extending to the middle but not to the lateral margins, its posterior edge straight, the posterior angles rounded, the second band occupies the entire apex and has its anterior angles rounded, these bands are separated by the testaceous ground-colour in shape of a transverse band of nearly similar size as the dark ones; under side and legs black, apex of abdomen flavous; claw-joint not strongly thickened.

Hab. Peru.

Principally distinguished by the position and shape of the posterior band in connection with the flattened sides of the thorax.

ASPHÆRA GLABRIPENNIS, sp. n.

Obscure testaceous; the thorax with gradually flattened sides, impunctate; elytra impunctate, with a metallic bright green subquadrate spot at the base and another one near the apex; posterior femora with the apex black.

Length 7–10 millim.

Of elongate and flattened shape, of a rather dirty testaceous; the head finely punctured at the sides as well as the space in front of the eyes, the frontal elevations broad, clypeus rather strongly raised; antennæ long and slender, obscure testaceous, the terminal joints very elongate; thorax with gradually flattened sides, narrowed anteriorly, the anterior margin deeply concave, the sides nearly straight, anterior angles in shape of a small tooth, the surface impunctate; scutellum testaceous; elytra entirely impunctate, with two brilliant metallic green bands or patches, the first at the base, not extending to the sutural or lateral margin and downwards to about one-third the length of the elytra, the other band of more rounded shape near the apex, not extending to either margin; below finely pubescent; the apex of the posterior femora black; claw-joint moderately swollen.

Hab. Marcapata, Peru.

I would have referred this species to *A. chapuisi* Har., but the author gives the colour as rufo-testaceous and the elytra as finely punctured, but even with a strong lens I cannot discover any punctuation.

ASPHÆRA FUNEREA, sp. n.

Black; thorax whitish or obscure testaceous, the flattened sides well separated; elytra very minutely punctured, coloured like the thorax, a broad transverse band at the base and another still broader band below the middle and interrupted at the outer portion, obscure brownish-æneous.

Length 6–7 millim.

Head sparingly punctured at the vertex, the latter piceous or blackish; eyes very large, each as broad as the dividing space; antennæ long and slender, black, the lower joints sometimes testaceous at the base, very elongate with the exception of the second one; thorax with flattened and well-separated sides, the anterior margin but little concave, the angles produced outwards into a truncate tooth, the surface impunctate, pale testaceous; scutellum broad, black; elytra with distinct basal depression, very finely punctured, with narrow reflexed lateral margins, pale testaceous or whitish, with two broad dark brown bands with greenish gloss, the first at the base, not extending to the lateral margins, the other band of much longer shape, not extending to the sides or apex of the elytra, at its outer edge it is semidivided by a narrow stripe of the ground-colour; under side piceous or black; metatarsus as long as the following two joints together, claw-joint distinctly swollen.

Hab. Peru.

There are two specimens of this species before me, which is well distinguished by the produced, truncate, anterior thoracic angles and the markings of the elytra; the ground-colour of the latter is in one specimen of a pinkish-white tint, in the other obscure testaceous, the dark bands are divided at the middle by the narrow transverse stripe of the ground-colour.

ASPHÆRA BREVICOLLIS, sp. n.

Piceous, legs black, the head and antennæ fulvous; thorax scarcely twice as broad as long, flavous, impunctate; elytra impunctate, flavous, a broad transverse band at the base and a transverse spot below the middle metallic green.

Length 7 millim.

Head impunctate, fulvous; frontal elevations broad, divided by a deep groove and bounded behind by a narrow, more shallow sulcus; clypeus strongly raised in shape of a broad triangular ridge; eyes widely separated; antennæ extending to the middle of the elytra, dark fulvous, the third joint shorter than the fourth; thorax scarcely twice as broad as long, the sides obliquely narrowed anteriorly, the lateral sulci rather narrow, the anterior angles thickened and strongly produced, the surface impunctate, flavous; scutellum black; elytra slightly widened towards the middle, distinctly depressed below the base, flavous, with two bright metallic-green transverse bands, the first at the base extending downwards to about one-third the length of the elytra, the other in shape of a large slightly oblique spot, below the middle, neither of the bands extending to the lateral margins; breast and abdomen piceous, legs black; metatarsus elongate, claw-joint but slightly swollen.

Hab. Peru.

The comparatively small width of the thorax and the widely separated elytral green bands, in connection with the fulvous head and antennæ, distinguish this species, which is evidently closely allied to *A. oblecta* Baly; but the head has no punctures nor hairs, the thorax is certainly not "more than twice as broad as long," and the elytra are not furnished with hairs at the apical margins.

ASPHÆRA DIMIDIATICORNIS, sp. n.

Flavous, head piceous, the intermediate joints of the antennæ black; thorax flavous, impunctate; elytra not perceptibly punctured, pale flavous, a transverse band at the base and a broader one below the middle metallic green; legs fulvous.

Length 6 millim.

Head impunctate, the vertex piceous; frontal elevations strongly raised, pyriform; clypeus flavous, semicircular, with an acute central ridge; eyes very large, the diameter of each larger than the dividing space; antennæ long and slender, the lower and the apical three joints fulvous, the rest black, third and fourth joints very elongate, equal, apical joints shorter; thorax twice as broad as long, slightly narrowed anteriorly, the anterior angles pointed but not produced, lateral margins evenly rounded, preceded by a broad sulcation, the surface impunctate, flavous; scutellum fulvous; elytra widened at the middle, yellowish-white, with two broad transverse metallic-green bands, not extending to the lateral margins, the first extending from the base to nearly the middle, the second immediately below the latter and abbreviated at some distance from the apex, both bands are of nearly subquadrate shape; the breast and the legs pale fulvous, abdomen flavous, the tarsi obscure piceous; the metatarsus moderately elongate, claw-joint strongly swollen.

Hab. Ecuador.

Distinguished by the colour of the head and the antennæ, the large eyes and broad elytral bands, pale legs, &c.

ASPHÆRA DEJEANI, sp. n.

Black; thorax impunctate, testaceous, the entire disc black; elytra impunctate, testaceous, a broad band at the base and another below the middle, not extending to the lateral margins, metallic blue; claw-joint scarcely swollen.

Length 8 millim.

Head with some punctures near the eyes, black, frontal elevations strongly raised, narrow and transverse; antennæ extending beyond the middle of the elytra, black, all the joints elongate and slender, the third and fourth equal; thorax twice as broad as long, the lateral margins scarcely rounded, the anterior angles more than usually produced and pointed (in one specimen to a much smaller extent), anterior margin concave, the sides broadly but not deeply sulcate, testaceous as well as the extreme base, the rest of the surface occupied by a transverse black band; scutellum black;

elytra with the basal portion rather convex, impunctate, metallic blue, the lateral margins and a rather narrow transverse band at the middle testaceous, epipleuræ of the latter colour; below and the legs black; metatarsus rather elongate, claw-joint scarcely swollen.

Hab. Peru.

The black band of the thorax and the strongly dentate and produced anterior angles of the latter, together with the nearly simple claw-joint, principally characterise this species.

Elytra metallic, with flavous margins.

ASPHÆRA ALBICINCTA, sp. n. (Plate XIV. fig. 4.)

Black, thorax pale flavous, impunctate; elytra metallic blue, the disc foveolate and rugose, the lateral margins yellowish-white; abdomen flavous.

Length 9–10 millim.

Of ovately-elongate shape, rounded below the middle; the head black, with some few punctures near the eyes, longitudinally grooved between the latter; antennæ extending to the middle of the elytra, black, the third, fourth, and fifth joints equal, the following ones shorter; thorax with gradually flattened sides, the anterior margin deeply concave, anterior angles slightly produced into a small tooth, thickened, the disc entirely impunctate, pale yellowish; scutellum black; elytra bright metallic blue or purplish, variolose-punctate, the interstices strongly wrinkled or rugose, the lateral margins to the apex whitish; breast and legs black; metatarsus elongate, claw-joint slightly swollen; abdomen flavous.

Hab. Peru.

Of the same coloration as *Asphæra* (*Aspicela*) *albomarginata* Latr., and of nearly similar sculpturing, but a true *Asphæra* (like the last-named species) on account of the metasternum not being truncate anteriorly; in Latreille's insect the thorax is margined with black and the elytral foveæ are larger and less numerous.

Elytra variously coloured, with transverse pale bands or with spots.

ASPHÆRA BISBIPLAGIATA, sp. n.

Obscure fulvous or fuscous, the head and the antennæ black; thorax yellowish white; elytra impunctate, each with two white bands, one transversely shaped at the middle, the other more rounded near the apex.

Length 7 millim.

Head with some deep punctures near the eyes, the vertex nearly black, the frontal elevations bounded behind by a very deep transverse groove; base of the antennæ flavous, the basal two joints piceous, the others black; thorax with the anterior margin straight, the sides not flattened, but the lateral margins gradually and very strongly thickened at the anterior angles, the latter produced but not dentiform, the surface impunctate, nearly white; scutellum dark brown; elytra of the same colour or dark fuscous, shining, impunctate, each with two white markings, the first at the middle in shape of a transverse band not quite extending to either margin, the second of rounded shape, near the apex; the breast piceous; the legs dark fulvous; the abdomen testaceous or flavous; claw-joint rather strongly swollen; prosternum very narrow and parallel.

Hab. Colombia.

In some specimens the ground-colour of the elytra is much paler. The absence of a thoracic flattening of the sides and the position and colour of the elytral markings distinguish this species.

ASPHÆRA BIPLAGIATA, sp. n.

Black, thorax and the femora flavous; elytra nearly impunctate, the lateral margins, a large discoidal patch, and the apex flavous; apex of the posterior femora black.

Length 5–6 millim.

Head black, with one or two punctures near the eyes; antennæ black, the lower two joints flavous below, third and following joints nearly equal; thorax nearly twice as broad as long, the sides rounded anteriorly, with a broad flattened sulcus, the anterior angles thickened but not produced, the surface impunctate, flavous; scutellum black; elytra impunctate; under side, the apex of the posterior femora, and the tibiæ and tarsi black, rest of the femora flavous.

Hab. Brazil.

This *Asphæra* resembles almost exactly *A. episcopalis* Ill. in the elytral pattern, which consists of a transverse black band at the base and another near the apex connected by a very narrow sutural stripe, the disc in shape of a large oval patch and the apex as well as the lateral margins being flavous. The differences which separate this species are: the entirely black head, without the whitish frontal tubercles; the anterior angles of the thorax, which are not produced; the position of the posterior elytral band, which is placed much lower down than in the above-named species; and the colour of the legs. I have received several specimens from the La Plata Museum without a special locality.

ASPHÆRA ERICHSONI, sp. n.

Black; thorax testaceous, the sides straight, the surface impunctate; elytra nearly black, the lateral margins and an extremely narrow transverse straight band at the middle flavous.

Length 6 millim.

Head with a few punctures above the eyes, black, the frontal elevations very broad and flat, scarcely raised, the base of the antennæ flavous; the antennæ very long and slender, black, the fourth joint longer than the third; thorax only about one-half broader than long, slightly narrowed anteriorly, the sides nearly straight, with an extremely narrow thickened margin, only obsoletely flattened in front of it, the anterior angles slightly mucronate, the surface entirely impunctate, pale flavous or testaceous; scutellum black; elytra not perceptibly punctured, black, very shining, nearly parallel, the lateral margins narrowly and an equally narrow transverse band at the middle, flavous; under side and legs black; the metatarsus elongate, the claw-joint but slightly swollen.

Hab. Peru.

The comparatively long thorax, the nearly straight and but slightly flattened sides, in connection with the very narrow and straight elytral pale band at the middle, well distinguish this species from others similarly marked.

ASPHÆRA MACULICOLLIS, sp. n.

Black, the antennæ obscure fulvous; thorax pale testaceous with a transverse piceous band, the sides straight; elytra entirely impunctate, metallic green, the lateral margins and a transverse narrow band at the middle flavous; claw-joint distinctly swollen.

Length 5 millim.

Smaller than the preceding species; the elytra more widened at the middle, with a broader lateral reflexed margin; the head with a single puncture close to the eyes, black at the vertex, the lower portion stained with flavous, the frontal elevations broad, trigonate, divided by a deep narrow groove; clypeus strongly raised; antennæ dark fulvous, the third and fourth joints very elongate, the following joints shorter; thorax with nearly straight lateral margins, the sides flattened, the anterior angles mucronate; the disc impunctate, whitish, with a narrow transverse piceous band; scutellum black; elytra with broad flattened lateral margins, impunctate, metallic green, the flattened sides and a transverse narrow band at the middle pale yellowish; below and the legs black; metatarsus elongate; claw-joint distinctly thickened.

Hab. Peru, Marcapata.

Separated by the sculpture and colouring of the head and that of the antennæ, the thoracic transverse band, and colour of the elytra. The general size is smaller than that of the allied species. *A. nobilitata* Fab. is of different coloration, although the elytral pattern is similar and the claw-joint is scarcely swollen. *A. discofasciata* Baly is another closely allied species, but has differently coloured antennæ, rounded sides of the thorax, finely punctured elytra, and their transverse band broad, not narrow.

ASPHÆRA APICALIS, sp. n.

Black or piceous, the basal joints of the antennæ and the clypeus flavous; thorax impunctate, fulvous or flavous; elytra greenish-æneous or purplish, impunctate, the lateral margins, a transverse band at the middle, a spot near the scutellum, another one below the middle, and a short oblique stripe near the apex flavous.

Var. *a.* The elytral transverse band and the spots absent.

Var. *b.* Elytra as in the type, but the spots absent.

Var. *c.* The transverse band indicated by a sutural and lateral spot; the other spots wanting.

Var. *d.* Like var. *c*, but the apical stripe as well as the spots wanting.

Length 7 millim.

Head entirely impunctate, with the exception of one or two punctures near the eyes, the frontal elevations broadly transverse; clypeus flavous, with an acutely raised central ridge; antennæ dark fulvous, extending slightly below the middle of the elytra, the third and fourth joints equal; thorax strongly transverse, the lateral margins rounded, the anterior angles thickened but not dentiform, the sides with a longitudinal groove, flattened, the surface impunctate, fulvous or flavous, posterior margin nearly straight; scutellum black; elytra impunctate, but the paler markings with minute fuscous spots, the ground-colour metallic greenish cupreous, the lateral margins, elytral epipleuræ, a narrow transverse band at the middle, a small spot near the scutellum, another below the middle near the suture, and a short oblique streak near the apex at the sides flavous; under side piceous; the anterior legs more or less pale, the metatarsus of the posterior legs as long as the following two joints; claws rather strongly swollen.

Hab. Peru, Prov. Huallaga; also Bolivia.

The type of this species, from which I have drawn the above description, is not difficult to distinguish from others, on account of the elytral markings, and is principally separated by the subapical short flavous streak which is connected with the similarly coloured lateral stripe. Some of the varieties, however, are without this mark, and consequently resemble several other similarly coloured species; there is, however, nearly always the indication of the transverse band in shape of a small flavous sutural spot at the middle and a corresponding one opposite at the margins; the thorax has the sides well defined by a deep longitudinal groove, and the claw-joint is more strongly swollen than in many other species of the genus.

Of var. *d* two specimens are before me. In these the elytral spots and band are absent, but, as usual, the sutural remnant of the band is present, and instead of the subapical short streak there is a widening of the flavous lateral margin at the corresponding place, thus indicating the typical mark. *Oedionychis dipus* Ill. is of exactly similar coloration, but is a true *Oedionychis* with a short posterior metatarsus.

Asphæra elegantula, sp. n. (Plate XIV. fig. 6.)

Black; clypeus and the thorax flavous, the latter impunctate; elytra bright metallic blue, impunctate; a narrow transverse band at the middle and another near the apex, as well as the lateral margins, flavous.

Length 8–9 millim.

Head black, shining, with a few deep punctures near the eyes; the latter large, widely separated; clypeus acutely triangularly raised, flavous; labrum black, with a row of punctures; antennæ long and slender, black; thorax short and strongly transverse, the sides feebly rounded anteriorly, straight at the base, the anterior angles thickened and produced, the sides broadly flattened, with a thickened margin, the flat portion well defined from the convex surface, the latter impunctate, obsoletely transversely depressed or grooved near the base; scutellum broad, black; elytra with a distinct depression below the base, not perceptibly punctured, bright metallic blue; the lateral margins, the epipleuræ, and two narrow transverse bands flavous—of these the first is placed at the middle and extends quite to the suture, the second one is situated very near the apex, not quite extending to the suture and of slightly upward direction; metatarsus elongate, claw-joint moderately thickened; the anterior femora more or less stained with flavous at the extreme base.

Hab. Peru, Prov. Huallaga (*G. A. Baer*).

Of this handsome species I have received several specimens from M. Clavareau, of Brussels. I know no other species with similar shaped and same number of bands.

Elytra blue.

Asphæra tibialis, sp. n.

Pale flavous, the head, antennæ, tibiæ, and tarsi black; thorax impunctate; elytra metallic blue, impunctate.

Length 7 millim.

Head entirely impunctate, black; clypeus acutely raised, triangular, slightly stained with flavous, palpi robust; antennæ extending below the middle of the elytra, black, third joint slightly shorter than the fourth; thorax with the sides gradually flattened, with narrow thickened margins, the anterior angles thickened but not dentiform and scarcely produced, the disc impunctate, flavous; scutellum black; elytra with a shallow transverse depression below the base, entirely impunctate, dark metallic blue, below flavous; the tibiæ and tarsi black, extreme base of the posterior tibiæ flavous; claw-joint moderately thickened.

Hab. Amazons,

Of this species, distinguished by its system of coloration, five specimens are contained in my collection.

Elytra with longitudinal fulvous bands.

Asphæra ferrugineo-vittata, sp. n.

Elongate, subparallel, testaceous; thorax with strongly rounded and broadly flattened sides, impunctate; elytra with a narrow sutural and an equally narrow discoidal longitudinal band, ferrugineous.

Length 6 millim.

Head impunctate or with a few fine punctures; eyes large, the diameter of each as wide as the intermediate space, frontal elevations subquadrate, carina short and blunt; antennæ scarcely extending to the middle of the elytra, pale fulvous, basal joint robust and elongate, third joint slightly shorter than fourth, terminal joints shorter than the intermediate ones; thorax short, the sides broadly sulcate, anterior angles with a short tooth, the disc impunctate, with an obsolete transverse sulcus near the base; elytra nearly parallel, somewhat flattened, finely and closely punctured, testaceous, the suture very narrowly ferrugineous; a similar, slightly and inwardly curved band extends from the shoulders to near the apex; metatarsus as long as the following two joints together, claw-joint strongly swollen; prosternum linear.

Hab. Bolivia.

The elytral dark bands are very narrow and of equal width and the discoidal one is of slightly curved shape. The species, on account of the distinctly elongate metatarsus of the posterior legs, cannot be mistaken for a similarly coloured species of *Oedionychis.*

Elytra otherwise marked.

ASPHÆRA LACERATA, sp. n.

Elongate and parallel, black; thorax dark fulvous, impunctate, the anterior angles produced and blunt; elytra finely rugose anteriorly, impunctate, black, a round patch at the base, a small one at the shoulders, a transverse subdivided patch at the middle, and another at the apex, testaceous.

Length 9 millim.

Head black, impunctate, the frontal elevations broad and flat; clypeus in shape of a strongly raised triangular ridge; eyes widely separated; antennæ black, long, the third and following joints equal; thorax transversely subquadrate, convex, of equal width, the lateral margins nearly straight, accompanied by very deep and narrow sulci, the anterior angles blunt and produced forwards, the disc impuncate, dark fulvous; scutellum black; elytra with narrow but deeply reflexed lateral margins, furnished with fine rugosities anteriorly but without punctuation, each elytron with four testaceous or pale flavous patches, which are separated by narrow transverse black bands before and below the middle, at the latter place the band sends off a spur towards the suture, thereby subdividing the preceding flavous portion; all the margins of the elytra as well as a humeral stripe and the epipleuræ are likewise black; of the same colour are the under side and the legs.

Hab. Peru.

I have only a single specimen of this somewhat peculiar species before me; whether the fine elytral rugosities to be seen at the anterior portion of the elytra are normal or accidental, I am unable to say. The design of the elytra resembles that of *Homophœta 8-guttata* Fab., but in that insect the vertex of the head has the characteristic white or flavous patch and the clypeus is of similar coloration; the elytra are smooth, and the intermediate flavous patch is never subdivided; in the Peru species the metatarsus is moderately elongate and the claw-joint rather strongly swollen.

ASPHÆRA NITIDISSIMA, sp. n. (Plate XIV. fig. 5.)

Broadly ovate, black; clypeus fulvous; thorax strongly transverse, fulvous, anterior angles toothed; elytra strongly convex, minutely punctured, bright metallic green, the lateral and apical margins and a narrow transverse band at the middle flavous or fulvous.

Length 10 millim.

Head impunctate, blackish; frontal elevations transverse, bounded by a deep groove behind; clypeus fulvous, acutely carinate at the middle; diameter of each eye of less width than the dividing space; antennæ long and slender, extending below the middle of the elytra, black, the third joint shorter than the fourth; thorax more than twice as broad as long, the lateral margins strongly rounded, deeply and broadly sulcate, the anterior angles strongly produced into a blunt tooth, the disc impunctate, fulvous, sometimes marked with two small fulvous spots; scutellum black; elytra broad, convex and widened posteriorly, deeply sulcate within the shoulders and with another shallow depression below the base, very minutely punctured, very bright metallic green, this colour divided at the middle by a narrow transverse fulvous band which joins the similarly coloured lateral margins; under side and legs black; the metatarsus of the posterior legs as long as the following two joints together; claw-joint strongly swollen.

Hab. Pachitea, Peru.

Larger and more broadly ovate than the other similarly coloured species of the genus; the antennæ slender and proportionately long; the thorax strongly toothed; the metatarsus somewhat intermediate between that of *Oedionychis* and the present genus as a rule, but as long as the following two joints together.

ASPHÆRA VIRIDICOLLIS, sp. n.

Black; thorax bright green, impunctate, the sides gradually flattened; elytra black or æneous, deeply foveolate, the lateral and apical margins green.

Length 7 millim.

Of medially slightly widened shape; the head black, impunctate, frontal elevations broad and convex; clypeus triangularly widened, not ridge-shaped; antennæ black, the third and fourth joints equal; thorax not more than twice as broad as long, rather widened at the sides, the lateral margins feebly rounded, anterior margin concave, its angles moderately produced, not toothed, the disc impunctate, gradually flattened at the sides, bright green, shining; scutellum black, trigonate; elytra broadly margined, with elongate deep foveæ, placed in about six longitudinal rows, the interstices strongly reticulate and confluent, the lateral margins rather broadly green, furnished with single hairs near the apex, rest of the surface shining black or bronze; under side and legs black; metatarsus elongate; claw-joint but slightly swollen.

Hab. Ecuador.

At once distinguished from *A. inæqualis* Erichs. by the green thorax and sides of the elytra and by the entirely black breast and abdomen. I know of no similarly coloured species.

Asphæra tessellata, sp. n. (Plate XIV. fig. 8.)

Black, head spotted with flavous; thorax impunctate, flavous, with a transverse black band; elytra extremely minutely punctured, flavous, two elongate spots at the base, a narrow transverse band below the middle, and a spot near the apex black.

Length 8 millim.

Head impunctate, black, the eyes surrounded by a flavous band, frontal elevations narrow, strongly raised, lower portion of face pale fulvous, labrum piceous; antennæ black, rather short, the basal joint fulvous below, third and fourth joints equal; thorax twice as broad as long, slightly arched, the sides flattened, with a narrow thickened margin which gradually widens anteriorly, the angles strongly thickened and produced, the disc impunctate, flavous, with a transverse black band, the anterior edge of which is concave and irregular in outline; scutellum black; elytra extremely minutely and closely punctured, flavous, the base with two elongate black spots, a short transverse black band placed much below the middle and another triangular spot near the apex complete the design of each elytron; under side and legs black; metatarsus of the posterior legs as long as the following two joints together, claw-joint strongly swollen.

Hab. Brazil.

I know only a single specimen of this well-marked and distinct species, without precise locality.

Asphæra variegata, sp. n.

Black; the clypeus, thorax, and abdomen flavous; elytra metallic green or obscure purplish, impunctate; a round spot near the scutellum, a transverse band near the apex, and the lateral margins flavous.

Var. *a*. Elytra with a narrow transverse band at the middle and another one near the apex, as well as the lateral margins, flavous, the basal spot absent.

Var. *b*. Elytra with a single band near the apex and the margins flavous.

Length 7–7½ millim.

Head impunctate, the vertex black, the clypeus flavous, frontal elevations rather broad and flat, transverse; clypeus in shape of an acutely raised triangular ridge; antennæ rather long and slender, black, the third and fourth joints equal; thorax about twice and a half broader than long, flavous, the lateral margins straight at the base, feebly rounded anteriorly, narrowly thickened, the anterior angles produced forwards and strongly thickened, the sides deeply sulcate, the disc impunctate, obsoletely transversely sulcate near the base; scutellum black; elytra with the basal portion rather strongly raised, impunctate, flavous, marked with bands of metallic green or purplish in various ways; the breast and legs black, the base of the femora more or less and the abdomen flavous.

Hab. Peru.

This is evidently a most variable species as regards coloration, but I have little doubt that all the forms represent but one species, as not the slightest structural difference seems to be present. In one form the elytra (if the testaceous colour is taken for that of the ground, which is justified by the similarly coloured epipleuræ) have the anterior two-thirds occupied by a metallic band, including a flavous spot near the scutellum and another narrow transverse band near the apex extending upwards along the suture, the lateral and apical margins remaining flavous; in var. *a* the metallic colour is interrupted by a narrow transverse band at the middle and another below the latter near the apex; in var. *b* there is only a single rather broad band near the apex and connected with the flavous lateral margins; the abdomen in all these forms remains flavous; the metatarsus of the posterior legs is as long as the following two joints together, and the claw-joint is strongly swollen.

A. variegata resembles a great deal *A. apicalis*, but is always larger, and the apical elytral flavous band is not placed so near the apex as in the last-named species, and the antennæ are black and the abdomen flavous.

ASPHÆRA BASIMACULATA, sp. n.

Oblong, nearly parallel, testaceous, the intermediate joints of the antennæ piceous; eyes rather closely approached; sides of thorax nearly straight, impunctate; elytra impunctate, each with two elongate short stripes at the base and a small spot (sometimes absent) near the apex.

Length 4 millim.

Head impunctate, frontal elevations subquadrate, eyes large and rather closely approached; antennæ slender, extending to the middle of the elytra, the lower four and the apical three joints testaceous, the others black or piceous, basal joint thickened and elongate, third and fourth equal, terminal joints shorter; thorax scarcely twice as broad as long, gradually narrowed anteriorly, the lateral margins straight, anterior angles pointed in shape of a small tooth, the sides strongly flattened, the disc impunctate, basal margin somewhat thickened and accompanied by a more or less distinct sulcus; scutellum broad, testaceous; elytra nearly parallel, minutely punctured, testaceous, each elytron with two short black stripes, one placed on the shoulders, the other near the scutellum, occupying about a fifth of the length of the elytra, near the apex at the sides is another small piceous or black spot which is sometimes obsolete or wanting; metatarsus of the posterior legs rather elongate.

Hab. Peru: Prov. Huallaga, Rio Mixiollo (*Baer*).

ASPHÆRA DIVISA, sp. n. (Plate XIV. fig. 9.)

Fulvous, the antennæ, the breast, and the abdomen black; head, thorax, and elytra impunctate, the last fulvous, their apical half metallic purplish-violaceous.

Length 8 millim.

Head with a single deep puncture and a few finer punctures near the eyes, fulvous; frontal elevations very broad and wide; clypeus acutely raised; labrum black; elytra long and slender, black, the basal joint fulvous; thorax narrowed anteriorly, the sides gradually flattened, the anterior angles produced into a short tooth, the disc entirely impunctate, fulvous; elytra widened towards the middle, with broad reflexed margins, the anterior half fulvous, the other portion metallic violaceous or purplish, the anterior edge of this colour rounded at the sides, also extending to the epipleuræ; breast, abdomen, the anterior and intermediate tibiæ and tarsi and the posterior legs black, the femora of the anterior and intermediate legs fulvous; claw-joint but slightly swollen.

Hab. Marcapata, Peru.

The purplish colour of the posterior portion of the elytra sometimes extends rather higher upwards than the middle; I know of no other similarly marked species of *Asphæra*.

ASPHÆRA FUSCOFASCIATA, sp. n.

Head, the antennæ, the underside, and legs obscure piceous; thorax yellowish white, with five obsolete fuscous spots; elytra impunctate, pale yellowish, with four transverse fuscous bands, the first divided into two spots.

Length 8–9 millim.

Head impunctate, piceous, the clypeus flavous; antennæ with the lower seven joints piceous or dark fulvous (the others wanting), the third joint slightly shorter than the fourth; thorax without a distinct flattening of the sides, but with the lateral margins thickened as well as the anterior angles which are produced forward, the surface impunctate, nearly white, the disc with five obsolete, more or less confluent fuscous spots, of which the three at the middle are better defined and placed triangularly; scutellum fuscous; elytra entirely impunctate, of yellowish-white ground-colour, with four transverse fuscous bands, one at the base and separated into two spots, the second near the middle, the third below the latter, and the fourth at the apex, all these bands are surrounded and separated by very narrow spaces or bands of the ground-colour; under side and legs pale piceous; claw-joint moderately swollen.

Hab. Bolivia; also Brazil.

Of this species I have seen a great many specimens of most variable coloration, some of which have the elytral bands very dark in regard to the basal and subapical ones, and the intermediate bands pale or absent altogether and entire or divided into two spots as described here. It is possible that the species is identical with *A. albida* Schauf.

Genus OEDIONYCHIS.

Elytra entirely pale-coloured or nearly so.

OEDIONYCHIS ROTUNDICOLLIS, sp. n.

Broadly ovate, subdepressed, pale testaceous; antennæ and the posterior femora obscure piceous; sides of thorax strongly rounded, broadly flattened, impunctate; elytra extremely minutely punctured.

Length 8 millim.

Head impunctate, frontal elevations transverse; antennæ pale piceous, the third joint slightly shorter than the fourth and following joints; thorax about twice and a half broader than long, the sides strongly rounded and broadly flattened, the anterior angles strongly pointed but scarcely dentiform, the surface impunctate; elytra broadly ovate, the margins narrowly reflexed, the base with a very shallow depression, the surface scarcely perceptibly punctured; posterior femora pale piceous.

Hab. Espirito Santo, Brazil.

The sides of the thorax in this species are more rounded than in any of the unicolorous members of the genus with which I am acquainted; the elytra are likewise of more broadly rounded shape than usual.

OEDIONYCHIS PARAGUAYENSIS, sp. n.

Short and convex, testaceous; apical joints of the antennæ black; thorax densely and strongly punctured, the sides not deeply flattened; elytra punctured like the thorax.

Length 7 millim.

Head somewhat closely punctured, frontal elevations oblique, carina short and broad; antennæ scarcely extending to the middle of the elytra, the lower three joints testaceous, the others black, third and following joints nearly equal, rather elongate; thorax twice as broad as long, the lateral margins feebly but evenly rounded, the anterior angles produced outwards into a small tooth, the surface rugosely and rather strongly punctured, the sides gradually and rather shallowly flattened; scutellum black; elytra rather strongly convex below the middle, sculptured like the thorax; legs short and robust.

Hab. Paraguay.

Of this species, very well distinguished by the almost rugose entire upper surface, I know of only a single specimen.

OEDIONYCHIS NIGROSUTURALIS, sp. n.

Black; thorax finely and sparingly punctured, testaceous; elytra strongly convex, closely and strongly punctured, testaceous, the extreme sutural margins black; abdomen fulvous.

Length 9 millim.

Head entirely black, with a few punctures near the eyes; clypeus strongly convex between the antennæ, the latter short, not extending to the middle of the elytra, black, the lower two joints obscurely stained with piceous, third joint distinctly shorter than the fourth; thorax rather more than twice as broad as long, the lateral margins strongly rounded, anterior angles not produced but thickened, sides deeply but narrowly sulcate, the disc very sparingly and finely punctured, testaceous; scutellum black; elytra rather strongly convex below the middle (when viewed sideways), with very narrow, thickened, reflexed margins, very closely and comparatively strongly punctured, the suture very narrowly black; breast and legs black; abdomen fulvous.

Hab. Brazil.

I know of only a single, apparently female specimen of this species, which is distinguished by the strongly punctured, convex elytra and black suture, as well as by the colour of the head and under side.

OEDIONYCHIS PICIFRONS, sp. n. (Clark Catal.).

Testaceous, the vertex of the head and the antennæ pale piceous; thorax impunctate; elytra very finely and closely punctured; posterior femora pale fulvous.

Length $6\frac{1}{2}$ millim.

Of somewhat flattened, oblong shape, the head impunctate, the vertex very pale piceous, frontal elevations strongly raised, trigonate; clypeus triangularly carinate; eyes large, widely separated; antennæ extending to the middle of the elytra, pale piceous, third and fourth joints equal; thorax with the sides rather strongly rounded and broadly flattened, the anterior angles thickened but only slightly produced, the surface impunctate; scutellum pale piceous; elytra slightly widened towards the middle, narrowly margined, extremely finely and rather closely punctured, the shoulders very prominent and deeply longitudinally sulcate within, the depressions more strongly punctured, pale testaceous; under side and legs coloured like the upper surface, the posterior femora pale fulvous or piceous.

Hab. Brazil.

Of more oblong shape, less broadly rounded than most of the unicolorous species, very pale testaceous, with the exception of the head, antennæ, and the posterior femora; the sides of the thorax rather strongly rounded, the shoulders very prominent.

OEDIONYCHIS MILLEPORA, sp. n.

Under side and legs dark brown ; the head black at the vertex, testaceous lower down ; antennæ (the basal joints excepted) black ; thorax testaceous, impunctate ; scutellum black ; elytra testaceous, closely and finely punctured.

Length 4–4½ millim.

Head rather strongly punctured at the sides of the vertex, the latter bluish-black ; clypeus testaceous, strongly carinate at the middle, the anterior portion forming a transverse ridge ; antennæ black, the lower three joints more or less stained with flavous, third and fourth joints equal, terminal joints rather short and stout ; thorax short and transverse, nearly similar to that of *O. obscuripennis* Jac., with a narrow transverse sulcus each side of the basal margin, the disc impunctate ; scutellum black ; elytra of the same shape and punctuation as in *O. obscuripennis* ; prosternum very narrow and elongate, also carinate, fulvous ; under side and legs piceous.

Hab. Colombia ; also Mexico.

The testaceous colour of the anterior portion of the head, the distinctly punctured vertex, and the colour of the antennæ and under side separate this species from the preceding one, and the partly testaceous head from *O. obscuripennis*.

OEDIONYCHIS DISTINCTA, sp. n.

Convex, widened posteriorly, testaceous ; terminal joints of antennæ black ; thorax with strongly rounded and deeply sulcate sides, impunctate ; elytra deeply, closely and strongly punctured, more finely and closely so towards the apex.

Length 8 millim.

Head with a few deep punctures at the vertex, deeply and broadly sulcate between the eyes, the latter widely separated, frontal tubercles rather obsolete ; carina broad anteriorly ; clypeus perpendicularly deflexed, bounded by an acute ridge above ; antennæ robust, black, the lower four joints testaceous, third joint shorter than the fourth, the following joints also less elongate than the fourth one ; thorax not more than twice as broad as long, rather wider at the sides (longitudinally), the latter strongly rounded, with broadly flattened sulci, the anterior angles slightly mucronate, the anterior margin deeply concave at the middle, the disc impunctate ; elytra strongly widened at the middle and convex, the reflexed margins not very broad, the surface deeply and closely punctured anteriorly, intermixed with some smaller punctures, the posterior portion extremely closely and more finely punctured ; metatarsus of hind legs very short ; claw-joint very strongly inflated.

Hab. Colombia.

More strongly punctured and convex than most of the allied species, the thorax of characteristic shape, and the antennæ with pale basal joints.

OEDIONYCHIS APICICORNIS, sp. n.

Elongate, nearly parallel, testaceous; antennæ black, the basal joint testaceous, the apical one fulvous; thorax impunctate, the sides rounded, the anterior angles scarcely mucronate; elytra extremely minutely punctured.

Length 5 millim.

Head impunctate, the eyes very large, frontal elevations broad, not strongly raised; clypeus deeply deflexed, not prominent; antennæ not quite extending to the middle of the elytra, black, the basal joint testaceous, the last one fulvous, third joint shorter than the fourth; thorax twice as broad as long, of even width, the lateral margins moderately strongly rounded, the anterior angles scarcely produced or mucronate, the sides deeply sulcate, the surface impunctate; scutellum testaceous; elytra slightly widened towards the middle, narrowly margined, extremely minutely and closely punctured; metatarsus short; claw-joint strongly swollen.

Hab. Bolivia.

Closely allied to *O. pallescens* but larger and the antennæ and legs of different coloration. *O. paupera* Illig. is described as being only 3 millim. in length and with an elongate first joint of the posterior tarsi, which show that the species is an *Asphæra*.

OEDIONYCHIS SORDIDA, sp. n.

Black, the head strongly punctured; thorax flavous, with rounded sides and mucronate anterior angles, impunctate; elytra finely punctured, flavous, the basal portion obscure fulvous; scutellum black.

Length $7\frac{1}{2}$ millim.

Broadly elongate, nearly parallel; the head bluish black, strongly and closely punctured, deeply transversely depressed between the eyes, the latter widely separated; antennæ rather short, black, the lower three joints shining, the rest pubescent, basal joint short and thick, third and fourth joints subequal, the last of wider shape, the following joints rather robust, cylindrical, slightly shorter; thorax twice as broad as long, of equal width, the sides deeply sulcate, the lateral margins rounded, the anterior margin produced outwards in shape of a small tooth, the surface flavous, impunctate; scutellum black; elytra slightly wider at the base than the thorax, with narrow reflexed margins, nearly parallel, finely but distinctly and very closely punctured; under side and legs black; prosternum longitudinally carinate.

Hab. Santa Catharina, Brazil.

There are two specimens of this insect before me, which, although they show some differences, I must refer to the same species. In one the head has only a few punctures and the extreme basal margin of the elytra is stained with black, the colour of the elytra is also entirely pale fulvous; but in structure the two specimens agree entirely. The species is closely allied to

O. navicularis, but is of more elongate and less convex shape and is much larger; the thorax is longer and less transverse.

Oedionychis ecuadoriensis, sp. n.

Broadly ovate, the head, antennæ, and the under side black; thorax flavous, impunctate; elytra obscure pale fulvous with slight purplish shade, extremely finely punctured.

Length 8 millim.

Head with a few fine punctures near the eyes, finely granulate, black, the frontal elevations pyriform, divided by a deep groove; clypeus flavous; eyes very large, but not closely approached; antennæ black, the basal three joints more or less testaceous above, third joint slightly shorter than the fourth; thorax with strongly rounded and broadly flattened sides, the anterior angles acute but scarcely produced, the disc rather convex, flavous, impunctate; scutellum triangular, fulvous; elytra widened towards the middle, with broadly reflexed margins, the latter pale; the disc obscure fulvous with a slight purplish tint, very finely and closely punctured; under side and legs black or piceous; metatarsus very short, claw-joint strongly swollen.

Hab. Ecuador.

This is a species of peculiarly dull appearance, unless this is caused by discoloration. The two specimens before me are, however, entirely similar in this respect, the shape is rather broadly ovate, and the elytral margins are proportionately broad.

Oedionychis rhodina, sp. n.

Oblong, nearly parallel, black; thorax rather short, testaceous, impunctate, the sides gradually flattened; elytra without prominent shoulders, testaceous, impunctate.

Length 7–7½ millim.

Head impunctate, black; frontal tubercles broad, ill-defined; eyes widely separated, with a few punctures placed between them; clypeus very short, strongly deflexed; antennæ not extending to the middle of the elytra, black, the third and following joints equal, terminal joints elongate; thorax rather short, the sides rounded anteriorly, the anterior margin concave, anterior angles produced into a short, blunt tooth, the disc impunctate, shining, testaceous, the sides flattened, but this portion limited within by a shallow sulcus only; scutellum more or less piceous at the base; elytra slightly wider at the base than the thorax, rather elongate, feebly widened only towards the middle, the shoulders but slightly prominent and bounded within by a shallow depression only, the surface nearly impunctate; below and the legs black.

Hab. Espirito Santo, Brazil.

A rather larger species, and principally differing in the less strongly flattened sides of the thorax, the oblong shape of the elytra and their less prominent shoulders and almost impunctate surface.

OEDIONYCHIS PALLESCENS, sp. n.

Pale flavous, the antennæ (the basal joints excepted), the knees, and the anterior and intermediate tibiæ and tarsi black; thorax impunctate; elytra exceedingly minutely punctured.

Length 4–4½ millim.

Head impunctate, deeply grooved between the eyes, the latter very large but well separated, frontal elevations transverse, strongly raised, carina linear, palpi flavous; antennæ extending to the middle of the elytra, black, the lower three joints flavous, third joint very slightly shorter than the fourth; thorax one half broader than long, slightly narrowed anteriorly, the sides narrowly flattened, the lateral margins rounded, anterior angles produced into a small tooth, the disc impunctate; elytra slightly widened towards the middle, narrowly margined, the base not depressed, the surface very minutely and closely punctured; the knees, the anterior and intermediate tibiæ and tarsi black (but not always); the rest of the legs and the under side flavous, the posterior femora sometimes with a piceous spot near the apex.

Hab. Peru.

Principally distinguished by the colour of the legs and its small size.

OEDIONYCHIS INCONSPICUA, sp. n.

Testaceous, the intermediate joints of the antennæ black; eyes closely approached; thorax impunctate; elytra finely and closely punctured.

Length 5 millim.

Head impunctate, deeply grooved between the eyes, the latter very large, each broader than the space dividing them; clypeus short and thick; antennæ not extending to the middle of the elytra, black, the lower three and the apical two joints testaceous, third and fourth joints equal; thorax twice as broad as long, the sides rounded, broadly flattened, the anterior angles slightly produced but blunt, the surface impunctate; elytra rather convex, nearly parallel, extremely minutely punctured; below and the legs testaceous, the breast more or less pale piceous; first joint of the posterior tarsi as long as the following two joints together, claws strongly swollen.

Hab. Amazons.

Larger than *O. pallescens*; the antennæ of different colour, the eyes larger and more closely approached, the metatarsus of the posterior legs rather longer than usual, but not so pronounced as in *Asphæra*, and the thorax typical of the genus. There are four specimens before me.

OEDIONYCHIS HERBACEA, sp. n.

Black, head finely punctured; thorax testaceous, the sides strongly rounded, finely wrinkled; elytra convex, testaceous, strongly and closely punctured, the extreme basal and sutural margins black; abdomen testaceous.

Length 8 millim.

Of strongly convex, posteriorly widened shape, the head distinctly punctured at the vertex and near the eyes, black, the middle of the base with a short longitudinal groove, frontal tubercles narrow and transverse: antennæ black, not extending to the middle of the elytra, the lower three joints testaceous below, short, the third joint slightly shorter than the fourth; thorax strongly transverse, the lateral margins strongly rounded, the anterior angles thickened but not dentiform, the sides rather broadly flattened, the disc minutely aciculate and extremely finely punctured; scutellum black; elytra strongly convex, rather suddenly deflexed below the middle, closely, evenly and strongly punctured, the sides below the shoulders somewhat flattened, the margins only slightly thickened, not reflexed, the extreme basal and sutural margins black; abdomen obscure testaceous; rest of the under surface and the legs black.

Hab. São Paulo, Brazil.

Amongst the nearly unicolorous species the present one is well distinguished by the shape and sculpture of the thorax and elytra and by the coloration. *O. balyi* Cl. has a differently shaped thorax and finely wrinkled elytra.

OEDIONYCHIS NIGROTIBIALIS, sp. n.

Head pale fulvous, the antennæ, the anterior and intermediate tibiæ, and the tarsi black; thorax flavous; elytra fulvous, nearly impunctate; under side and legs testaceous.

Length 6 millim.

Oblong-ovate; the head pale fulvous, with a few punctures near the eyes; labrum piceous; antennæ black, the third and fourth joints equal, terminal joints shorter and thicker; thorax rather strongly convex, the sides rounded and broadly flattened, the anterior angles thickened, slightly truncate, not produced, the surface very shining, impunctate, flavous; scutellum black; elytra dark fulvous, impunctate, with the exception of a short double row of punctures below the shoulders; below pale fulvous, the anterior and intermediate tibiæ and all the tarsi black, posterior tibiæ fulvous.

Hab. St. Catharina, Brazil.

Of rather convex and oval shape, and distinguished by the flavous thorax and the colour of the legs.

OEDIONYCHIS CONSIMILIS, sp. n. (Clark Catal.).

Black, the clypeus testaceous; thorax with broadly flattened sides, impunctate, testaceous; scutellum black; elytra very finely, partly obsoletely punctured, testaceous.

Length 8 millim.

Of posteriorly slightly widened shape; the head black, with a few punctures placed in a row in front of the eyes; clypeus testaceous, the carina very prominent; antennæ black, the lower two joints more or less flavous below, the third joint distinctly shorter than the fourth; thorax with the sides broadly flattened, the anterior angles pointed but not produced, the disc impunctate, testaceous, the lateral margins feebly rounded anteriorly; scutellum black; elytra convex, without basal depressions, with narrow reflexed margins, closely and very finely punctured, testaceous; under side and legs black, the abdomen more or less flavous at each side.

Hab. Peru.

Very closely allied to *O. plebeja* Klug, but in that species the head is punctured at the vertex and the eyes are margined with testaceous, the elytra are more strongly punctured, and the "habitat" of the species is Brazil. I have preserved Clark's catalogue name for the present species, of which specimens are also contained in the British Museum. *O. obscuripennis* Jac., also from Peru, is likewise very closely allied, but is a smaller insect, of different shape, with the anterior angles of the thorax mucronate and a much more flattened carina of the clypeus.

OEDIONYCHIS NIGRIMANA, sp. n.

Black; thorax short and strongly transverse, impunctate; elytra finely punctured, pale greyish-testaceous.

Length 5 millim.

Of medially gradually widened shape, moderately convex; the head entirely impunctate, black, the frontal elevations transverse, contiguous, carina acute, convex; antennæ black, the third and fourth joints equal (the rest wanting); thorax short, of equal width, more than twice as broad as long, the lateral margins rounded, the sides broadly flattened, the anterior angles neither thickened nor produced, the surface impunctate, black, very shining; scutellum black; elytra gradually widened towards the middle, finely and closely punctured, pale greyish-testaceous, below and the legs black; metatarsus moderately short, claw-joint very strongly inflated; prosternum proportionately broad.

Hab. Peru.

Of similar coloration to *O. turpis* Jac., but much smaller, the head and thorax entirely black and the elytra without apical black spot.

OEDIONYCHIS ALBIPENNIS Jac.

Since this species was described (P. Z. S. 1894, p. 609) I have received a good many more specimens from the Amazon regions, which prove that the insect is extremely variable in regard to size as well as to coloration. The type was described from nearly unicolorous specimens; those now before me show the following elytral markings:—

a. Two spots at the basal margin; a longitudinal streak near the side, very broad at its commencement, strongly pointed at the apex.

b. The basal spots absent; each elytron with a narrow, oblique band from the middle of the base to the lateral margin below the middle.

c. The extreme basal margin, connected with a narrow sublateral longitudinal stripe, black.

d. Elytra with two basal small spots and another at the middle.

In all these forms the anterior and posterior margins of the thorax are more or less black, and frequently this colour occupies the entire middle of the disc, leaving only the sides testaceous; the eyes are closely approached, and the head at the vertex is generally finely punctured and wrinkled, but sometimes impunctate; the metatarsus of the hind legs is scarcely typical of *Oedionychis*, being rather more elongate, but not to such an extent as to include the species in *Asphæra*. The form with three black spots can scarcely be distinguished from *O. humeralis* Fab., but in that species all the specimens I have seen have a unicolorous testaceous thorax, without any markings, and no black basal elytral margin. All the specimens before me (16) come from the Amazon regions.

Elytra pale, with spots and bands combined.

OEDIONYCHIS PARALLINA, sp. n.

Head and breast black; thorax testaceous, impunctate; elytra extremely minutely punctured, flavous, two spots at the base, two others below the middle, and a transverse band at the latter place black; legs testaceous, apex of the posterior femora black.

Length 6–7 millim.

Of posteriorly slightly widened shape, rather flattened; the head black, the vertex minutely granulate and punctured, frontal elevations very broad, trigonate, eyes extremely large, carina acute; palpi flavous; antennæ rather robust, the basal four and the apical three joints flavous, the rest black, third and following joints nearly equal; thorax more than twice as broad as long, the sides gradually but broadly flattened, the posterior margin straight, the anterior angles not produced, the disc impunctate, testaceous; scutellum black; elytra extremely minutely and closely, almost confluently punctured, testaceous, the shoulders with an elongate black spot, another round spot near the scutellum; a transverse narrow band at the middle and two spots near the apex, placed transversely, likewise black; breast black; abdomen and legs testaceous, the posterior femora black at the apex.

Hab. Brazil.

Easily known by the pattern of the elytra and system of coloration. The male insect is of considerably smaller size and much narrower.

OEDIONYCHIS COLOMBIANA, sp. n.

Piceous, above testaceous, the apical joints of the antennæ and the breast piceous; thorax impunctate; elytra subdepressed, extremely closely and finely punctured, the basal margin, a narrow transverse band below the middle, and two spots near the scutellum dark brown.

Length 7 millim.

Head impunctate, testaceous, the frontal elevations rather feeble; eyes large, the intermediate space not wider than the width of each eye; antennæ with the basal three or four joints and the apical one testaceous, the rest blackish; thorax short and transverse, the sides broadly flattened, the anterior angles dentiform; the disc impunctate, testaceous, feebly transversely sulcate near the base; scutellum testaceous; elytra widened towards the apex, rather flat, extremely finely and closely punctured, testaceous, the extreme basal margin, a small spot near the scutellum, and a narrow transverse, slightly convex band, immediately below the middle, piceous or dark fulvous; legs testaceous; breast and abdomen piceous.

Hab. Pichinché, Colombia (*Rosenberg*).

Of this species I have five exactly similar specimens before me. The design of the elytra differs from that of any other species I am acquainted with except *O. tenuicincta* Jac., which is a differently shaped insect, with a different thorax, very narrow elytral bands, and of black colour. This species is also known from Mexico.

OEDIONYCHIS DIVERSA, sp. n.

Testaceous, the apical joints of the antennæ (except the last) and the breast black; thorax impunctate; elytra elongate, finely punctured, each with two spots at the base, one at the middle, and a transverse band near the apex, black.

Var. The apical band divided into two spots.

Length 5 millim.

Head impunctate, deeply foveolate between the eyes, the latter very large; antennæ with the lower five and the apical joint testaceous, the others black, third and fourth joints equal, elongate, the terminal joints rather shorter; thorax about twice and a half broader than long, the sides broadly flattened, the lateral margins strongly rounded anteriorly, the anterior angles thickened but not produced, the surface impunctate, rather convex; scutellum black; elytra elongate, nearly parallel, very minutely punctured, testaceous, a small spot on the shoulders, another near the scutellum, a third at the middle, and a transverse band near the apex, not quite extending to either margin, black; legs and abdomen testaceous, breast black.

Hab. St. Catharina, Rio Janeiro, Brazil.

A somewhat elongate species, principally distinguished from those with similar elytral spots by the additional black subapical band and the black breast, colour of the antennæ, &c.

OEDIONYCHIS BISBINOTATA, sp. n. (Plate XV. fig. 8.)

Flavous, the apical joints of the antennæ black; thorax impunctate, with two small black spots; elytra minutely punctured at the base only, a spot on the shoulders, another near the scutellum, and the posterior half black.

Var. The thoracic and elytral spots absent.

Length 6 millim.

Head impunctate, flavous; eyes large, each as broad as the intermediate space, frontal elevations transverse; antennæ with the lower joints flavous, the terminal ones more or less black; thorax twice as broad as long, the sides rounded, narrowed in front and broadly flattened, anterior angles pointed, slightly produced, the surface impunctate, flavous, with two small back spots near the base; elytra nearly impunctate, except near the base, where there are a few minute punctures, flavous, a spot near the scutellum and one on the shoulders, as well as almost the whole posterior portion, black, but this colour not quite extending to the apex; under side and legs flavous; prosternum convex between the coxæ; metatarsus very short, claw-joint strongly swollen.

Hab. Peru.

Of this species I possess two specimens, in one of which some obsolete additional thoracic spots are present and the elytral ones absent, the shape of the posterior black portion is regular; in the other the anterior edge is deeply sinuate, but other differences I cannot find.

OEDIONYCHIS VARIATA, sp. n.

Obscure piceous below, above testaceous; thorax impunctate: elytra subdepressed, extremely minutely punctured, the basal margin, a spot on the shoulders, another oblique spot near the scutellum, a transverse narrow band at the middle, and another spot near the apex, black.

Length 7 millim.

Head impunctate, the frontal elevations feebly raised, carina short and convex; antennæ fulvous, the third joint shorter than the fourth (♀) or equal (♂); thorax with broadly flattened sides, the lateral margins nearly straight, obliquely narrowed anteriorly, the disc rather flat, impunctate, testaceous, the anterior angles in shape of a small tooth; elytra evenly rounded and widened at the middle, broadly margined, scarcely perceptibly punctured, testaceous, the extreme basal margin, connected with an elongate spot which covers the shoulders, an oblique comma-like spot near the scutellum, a narrow transverse band (somewhat angulate near the lateral margin) at the middle, and another transverse spot near the apex, black; below and the legs testaceous.

Hab. Bolivia.

Well distinguished by the shape and the position of the elytral spots.

OEDIONYCHIS INGRATA, sp. n.

Testaceous, the apical joints of the antennæ piceous; thorax impunctate, the anterior angles not produced; elytra finely punctured anteriorly, a sutural pear-shaped spot below the scutellum and a transverse band below the middle bluish-black; breast black.

Length 5 millim.

Head impunctate, deeply foveolate between the eyes, the latter rather closely approached; antennæ with the lower four joints fulvous, the rest piceous, the joints comparatively short; thorax about twice as broad as long, the sides feebly rounded and narrowed anteriorly, the anterior angles thickened and not produced, the sides broadly flattened, the disc impunctate; scutellum black; elytra very finely punctured, except near the base and within the humeral depression, where the punctuation is stronger, the ground-colour testaceous, a sutural spot below the scutellum and an irregular narrow transverse band below the middle bluish-black, sometimes piceous; the breast black, the abdomen and legs testaceous.

Hab. Espirito Santo, Brazil.

Two exactly similarly coloured specimens of this species are before me; the design of the elytra differs from that of any other *Oedionychis*, and the general size of the insect is comparatively small.

OEDIONYCHIS VENEZUELENSIS, sp. n.

Flavous, the apical joints of the antennæ piceous; head with two black bands; thorax fulvous, impunctate; elytra extremely minutely punctured, with a spot at the shoulders, another near the scutellum, a transverse band before and another below the middle, black.

Length 6 millim.

Of somewhat flattened, posteriorly slightly widened shape; the head with a few punctures near the eyes, the latter very large, the diameter of each distinctly wider than the intermediate space; the vertex flavous, with a black stripe at each side, the space between the antennæ strongly convex in shape of a ridge, black; the palpi flavous; antennæ slender, the lower three joints flavous, the others blackish, third joint slightly shorter than the fourth; thorax not more than twice as broad as long, the sides nearly straight and slightly narrowed anteriorly, broadly flattened, the anterior angles thickened but scarcely produced, the disc impunctate, fulvous, the flattened portion flavous, the base with an obsolete transverse sulcus; scutellum flavous; elytra scarcely perceptibly punctured, flavous, the shoulders with a short, thick black spot, another one of more elongate shape is placed near the scutellum, a transverse, medially constricted black band is situated before and a second one below the middle; the under side and legs are flavous; metatarsus and claw-joint typical.

Hab. Venezuela.

Differs in the coloration of the head and the position of the elytral markings from any other species.

OEDIONYCHIS CENTROMACULATA, sp. n. (Plate XV. fig. 2.)

Testaceous or fulvous; antennæ (the apical joints excepted) black; thorax impunctate; elytra minutely punctured, a transverse band at the base, another below the middle, obscure fulvous, the intermediate space with four small black spots.

Length 6–7 millim.

Head impunctate, with a deep fovea between the eyes, the latter large, closely approached; antennæ black, the lower three or four and the apical two joints fulvous, third and fourth joints equal, the following joints rather shorter; thorax with rather strongly rounded sides, the latter broadly flattened, anterior angles mucronate, the disc impunctate, obscure fulvous; elytra widened at the middle, distinctly margined, extremely finely punctured at the base, fulvous, this colour divided at the middle by a narrow testaceous transverse band in which four black spots are placed transversely; under side and legs testaceous; prosternum in the male strongly convex anteriorly.

Hab. St. Catharina, Brazil.

Quite distinct in its system of coloration from any other species. Two specimens are before me.

OEDIONYCHIS ARCUATOFASCIATA, sp. n. (Plate XV. fig. 7.)

Ovate, subdepressed, greenish testaceous; thorax impunctate, with rounded sides; elytra scarcely perceptibly punctured, the basal margin, a narrow semicircular band at the base, a spot at the lateral and another near the sutural margins below the middle, black.

Length 5 millim.

Head impunctate, eyes large, frontal tubercles subquadrate, short, carina acute; antennæ extending to the middle of the elytra, testaceous, the third and fourth joints equal, terminal joint rather more robust; thorax quite twice as broad as long, of equal width, the sides moderately rounded, the lateral sulci deep, rather narrow, the base with another obsolete transverse groove, the surface impunctate; scutellum black; elytra widened towards the middle, rather flattened, pale greenish testaceous, with a few minute punctures (only visible under a strong lens), the extreme basal margin as far as the shoulders and a transverse semicircular narrow band below the base black; this band extends upwards along the suture to the scutellum, it is suddenly constricted at its middle and does not extend to the lateral margins, near the latter is another black spot, below the middle and a little lower a second one is placed near the suture; under side and legs testaceous.

Hab. Chilpancingo, Mexico.

I formerly looked upon this species as a variety of *O.* 13-*maculata* Jac., but a further careful examination has convinced me that it really represents another form, as the colour of the antennæ, shape and number of the elytral spots are different and exactly similar in the two specimens before me; this species is also of a less rounded and smaller shape.

Elytra blue or black, without markings.

Oedionychis subcostata, sp. n.

Metallic blue, the head and thorax reddish-fulvous, the latter finely punctate; elytra dark blue, rather opaque, closely and strongly rugose-punctate, with a single, very obsolete costa near the sides.

Length 7 millim.

Head impunctate, reddish-fulvous; frontal elevations strongly raised, transverse, carina linear, very convex; antennæ with the lower two joints fulvous, the following four black, the rest wanting, third joint shorter than the fourth; thorax transversely convex, about twice as broad as long, the sides broadly flattened, rounded in front, the anterior angles produced outwards into a small tooth, the disc with a rather distinct transverse groove near the base, minutely punctured when seen under a strong lens; scutellum black; elytra dark blue, rugosely punctured throughout, a slightly raised narrow line extends from within the shoulders to below the middle; under side and legs dark metallic blue, smooth and shining.

Hab. Brazil.

Oedionychis motschulskyi, sp. n.

Head at the vertex, the antennæ (the apical joints excepted), the under side, and the tibiæ and tarsi black; thorax and femora flavous; elytra metallic violaceous, finely and closely punctured.

Length 5 millim.

Head entirely impunctate, black, shining; the eyes widely separated; frontal elevations transverse, very strongly raised; clypeus triangular, flavous as well as the labrum; antennæ slender, extending to the middle of the elytra, black, the apical three joints fulvous, third and fourth joints equal; thorax nearly three times broader than long, flavous, the sides rounded, deeply sulcate, the anterior angles very slightly produced outwards into a blunt tooth, the surface entirely impunctate, obsoletely transversely sulcate near the base; scutellum black; elytra with a feeble impression below the base, convex, nearly parallel, very narrowly margined, finely and very closely punctured, metallic violaceous blue; legs flavous, the breast, abdomen, the apex of the posterior femora, and the tibiæ and tarsi black.

Hab. Peru.

The colour of the head, antennæ, and legs, and the rather narrow parallel shape of this species separate it from those of nearly similar coloration.

Oedionychis indigosoma, sp. n.

Head and thorax fulvous, nearly impunctate; elytra dark blue, closely and strongly semirugose punctate; below and the legs bluish black.

Length 7 millim.

Head fulvous, impunctate, eyes widely separated; antennæ black, the basal two joints obscure fulvous, terminal joints shortened, third and fourth equal; thorax twice as broad as long, the sides rounded anteriorly, the middle of the disc rather convex, the anterior angles produced outwards into a small tooth, the sides broadly flattened and subrugose, the surface impunctate, obsoletely transversely sulcate near the base; scutellum black; elytra not perceptibly depressed below the base, dark blue, not very shining, closely and distinctly rugose punctate throughout; below and the legs bluish black; prosternum comparatively broad, flavous.

Hab. Petropolis, Brazil.

A well-distinguished species on account of the colour and sculpture of the elytra.

Elytra dark, with flavous spots, patches, or bands.

OEDIONYCHIS INTERSIGNATA, sp. n. (Clark Catal.).

Black, thorax flavous; elytra closely and strongly punctured, violaceous or blue, a transverse band or broad patch at the middle, the apex and the lateral margins (partly) flavous.

Length 7 millim.

Head piceous or black, impunctate, eyes very large, as wide as the intraocular space, frontal elevations strongly raised, pyriform, carina acute; antennæ black, the lower three joints fulvous below, third and fourth joints equal; thorax quite twice as broad as long, the sides rounded, broadly flattened within, the anterior angles in shape of a very small tooth, the surface impunctate, flavous; scutellum black; elytra strongly and closely punctured, blue, violaceous or purplish, with a transverse flavous patch at the middle and a smaller one at the apex, the lateral margins anteriorly and posteriorly likewise flavous as well as the elytral epipleuræ; underside and legs black.

Hab. Espirito Santo, Brazil.

A rather variable species as regards the flavous markings of the elytra, but distinguished by the comparatively strong punctuation; the central flavous band scarcely extends to the suture, nor does the apical one, but both unite with the flavous lateral margins.

OEDIONYCHIS RUSTICA, sp. n.

Testaceous, the intermediate joints of the antennæ black; thorax impunctate; elytra extremely closely and finely punctured, a transverse band at the base, another of oblique shape near the apex, and the intermediate portion of the suture fulvous, more or less edged with piceous.

Length 5 millim.

Head impunctate, eyes very large and rather closely approached; frontal elevations broad, subquadrate, divided by a narrow groove; antennæ extending beyond the middle of the elytra, the five lower and the terminal two joints fulvous, the others blackish; thorax short and transverse, the sides rounded and broadly flattened, the anterior angles acute but not dentiform, the surface entirely impunctate, testaceous; scutellum piceous; elytra with broadly flattened margins, slightly widened at the middle, finely and closely punctured, testaceous, with two broad fulvous transverse bands—one at the base, deeply concave at its lower margin and connected by a sutural stripe with the second band near the apex of obliquely subquadrate shape, both bands are interrupted at some distance from the lateral margins and are more or less distinctly edged with piceous, the basal margin especially so; under side and legs testaceous.

Hab. Argentine R. and Brazil.

Not unlike *O. pustulata* Jac. in coloration, but the antennæ differently coloured, the thorax without a fulvous spot, and the elytral bands of different shape.

OEDIONYCHIS CATHARINÆ, sp. n.

Dark fulvous below, antennæ black; thorax flavous, impunctate; head and scutellum dark fulvous; elytra rather strongly and closely punctured, dark fulvous, a large discoidal ovate patch on each, flavous.

Length 6 millim.

Of rather elongate and parallel shape; the head impunctate, fulvous, deeply grooved between the eyes, the latter large, frontal elevations broad, transverse; carina blunt and thick; antennæ robust, black, third joint distinctly shorter than the fourth; thorax strongly transverse, the lateral margins distinctly rounded, the anterior angles but slightly produced outwards, scarcely toothed, lateral sulci broad and deep, the surface impunctate, flavous; elytra with narrow reflexed margins, fulvous, distinctly punctured, the disc occupied by a large flavous ovate patch, with its narrowest portion near the suture; under side and legs dark fulvous, the tibiæ and tarsi blackish; metatarsus very short, claw-joint strongly inflated.

Hab. St. Catharina, Brazil.

Of somewhat similar coloration to *O. 4-pustulata* Jac. from the same locality, but the thorax without fulvous spot, the antennæ entirely black, with more elongate joints, and the whole apex of the elytra fulvous; the thoracic sulci in the present species also are wider and deeper.

OEDIONYCHIS OCELLATA, sp. n. (Plate XV. fig. 10.)

Black, thorax testaceous, with three black spots; elytra closely and strongly punctured, each elytron with six small flavous spots (1.2.2.1).

Length 5 millim.

Head not perceptibly punctured, the middle black, the sides and the anterior portion testaceous, frontal tubercles short and broad, strongly raised, carina broad; antennæ rather short and robust, black, the lower three joints more or less flavous, third joint more slender and slightly longer than the fourth, the following joints thickened; thorax strongly transverse, the sides rounded, broadly flattened, anterior angles mucronate. the surface with a few minute punctures, testaceous, with three small black spots placed transversely; scutellum black; elytra with strongly but narrowly reflexed margins, rather strongly and very closely punctured, with a very feeble depression below the base, black, each elytron with six round flavous spots—of these, one is placed at the middle, just below the basal margin, two at the middle, placed transversely, two immediately below, and one at the apex; under side and legs black.

Hab. Paraguay.

A rather small and well-marked species, of which I possess a single specimen only.

Elytra with elongate spots or longitudinal black or flavous bands.

Oedionychis humboldti, sp. n.

Testaceous, the head and the breast black, sides of the thorax straight, the latter impunctate; elytra closely and finely punctured, two elongate spots at the base and two below the middle of each elytron black.

Length 6 millim.

Head black or nearly so, impunctate, the frontal elevations broad, trigonate, clypeus perpendicularly deflexed; antennæ robust, fulvous, the third joint smaller than the fourth; thorax narrowed in front, one-half broader than long, the sides straight, broadly flattened, the anterior angles produced into a small tooth, the surface impunctate, testaceous; scutellum testaceous; elytra nearly parallel, closely and distinctly, although finely punctured, testaceous, each elytron with two more or less elongate black spots at the base and two others below the middle—of the basal spots, one is placed on the shoulders and extends nearly down to the middle, the other shorter one is placed near the suture; the posterior spots are almost joined, the outer one being of more elongate shape than the inner; under side and legs testaceous, breast black.

Hab. Bolivia.

This *Oedionychis* is well distinguished by the straight lateral margins of the thorax, which are obliquely narrowed anteriorly, and by the four elytral spots. In one specimen the latter are represented by short and narrow stripes.

Oedionychis waterhousei (MS. Clark), sp. n.

Black, the clypeus flavous; head strongly punctured; thorax flavous, impunctate; elytra finely and closely punctured, bluish black, the lateral margins narrowly and a broad discoidal band, joined at the apex to the margin, flavous.

Length 6 millim.

Head piceous or black, the vertex coarsely punctured, the clypeus flavous; antennæ black, the third and fourth joints very nearly equal; thorax strongly transverse, the sides strongly but not broadly flattened, the lateral margins rounded in front, anterior angles dentiform, the surface impunctate, flavous, with a very obsolete transverse sulcus near the base; scutellum black; elytra finely and closely punctured, bluish black, the discoidal flavous stripe of double the width of the similarly coloured lateral margins and connected with the latter at the apex; under side and legs black; elytral epipleuræ with a very narrow inner dark margin.

Hab. Brazil.

This banded species is more nearly allied to *O. figurata* Chev. than to any other, and may be known by the dark head, antennæ, and legs, the broad discoidal elytral flavous stripe, which has somewhat irregular outlines, and by the inner dark margin of the elytral epipleuræ. The species, if these details be kept in view, cannot be mistaken for any of those of which v. Harold has given an analytical table (Berlin. ent. Zeitschr. 1881).

OEDIONYCHIS EXCLAMATIONIS, sp. n. (Plate XV. fig. 3.)

Testaceous, the intermediate joints of the antennæ black; thorax impunctate; elytra minutely punctured, two elongate spots at the base and a longitudinal stripe at the sides, strongly thickened at the upper end, black.

Length 7 millim.

Head impunctate; the eyes large, each as wide as the intervening space; carina short and convex, narrow; antennæ testaceous, the sixth to the ninth joints blackish, third smaller than the fourth joint; thorax more than twice as broad as long, the sides strongly rounded and broadly flattened, the anterior angles produced into a small tooth, the surface impunctate; elytra not wider at the base than the thorax, with narrow reflexed lateral margins, extremely finely and closely punctured, testaceous, the base with two black longitudinal short stripes, the sides near the margins with another longer narrow black stripe, which ends anteriorly rather abruptly in a club or knob directed towards the suture; under side and legs testaceous.

Hab. Brazil.

I know of only a single specimen of this rather peculiarly marked species, the exact locality of which is unknown to me.

OEDIONYCHIS INTERRUPTO-VITTATA, sp. n. (Plate XV. fig. 6.)

Testaceous, the head and the intermediate joints of the antennæ black; thorax impunctate, the anterior angles mucronate; elytra finely punctured, testaceous, each elytron with two more or less interrupted longitudinal black stripes; the breast black.

Length 6 millim.

Of flattened shape; the head impunctate, black, deeply foveolate between the eyes, the latter large, their diameter as wide as the dividing space; labrum fulvous; antennæ with the lower four and the apical three joints fulvous, the others black, third and following joints nearly equal, elongate; thorax with strongly rounded and flattened sides, the anterior angles mucronate and produced forward, the disc impunctate, testaceous, obsoletely transversely grooved near the base; elytra finely and closely punctured, rather flattened, narrowly marginate, each elytron with two narrow longitudinal stripes—one near the suture, the other near the lateral margins, below the middle both, or one, of the stripes are interrupted, so that only one or two elongate spots remain near the apex; under side and legs testaceous, the breast black.

Hab. St. Catharina, Brazil.

In one of the specimens the inner black elytral stripe only is interrupted; in the other this is the case with both stripes, there is also an indication of another stripe in shape of a minute spot between the others, placed at the middle. Amongst the species with elytral longitudinal bands the present one is well distinguished by the colour of the head, antennæ, and the shape of the elytral stripes, which resemble signs of exclamation.

Elytra pale, with transverse black or blue bands or spots.

OEDIONYCHIS BISTRIFASCIATA, sp. n.

Black or piceous, antennæ dark fulvous, clypeus flavous; thorax impunctate, flavous; elytra finely and closely punctured, flavous, each with three transverse dark blue bands, the first subquadrate and emarginate or subdivided at the base.

Length $5\frac{1}{2}$ millim.

Of rather elongate shape; the head bluish black, with some strong punctures near the eyes; clypeus and labrum flavous, the eyes likewise margined more or less with the same colour; antennæ extending to nearly the middle of the elytra, dark fulvous, the basal two joints more or less stained with black above, third and fourth joints equal, terminal joints slightly thickened; thorax rather more than twice as broad as long, the sides strongly but not very broadly flattened, the lateral margins rounded anteriorly, anterior angles produced into a short blunt tooth, the surface impunctate or with a few very minute punctures, obsoletely transversely grooved near the base, flavous; scutellum black; elytra finely and closely but distinctly punctured, with three transverse blue or purplish bands—the first at the base the largest, of subquadrate shape, its basal margin with a narrow incision, the second band immediately below the middle, half the width of the first band, the third near the apex, short and of subquadrate shape, none of these bands extends to either margin; below and the legs black or piceous.

Hab. Peru.

In one of the specimens before me the basal band is also rather deeply emarginate near the suture at the sides as well as at the base.

OEDIONYCHIS INFORMIS (MS. Clark), sp. n.

Testaceous, the head, breast, and abdomen (partly) black; thorax impunctate, scutellum black; elytra minutely punctured each with three transverse black bands; legs testaceous, the apex of the posterior femora and the base of the tibiæ black.

Length 6 millim.

Head narrow, dark piceous, impunctate, eyes large; two basal joints of the antennæ testaceous, the others wanting; thorax with the lateral margins strongly rounded, the sides very broadly flattened, anterior angles not produced into a tooth, the disc impunctate, testaceous; scutellum black; elytra with rather broadly reflexed lateral margins, extremely finely and closely punctured, testaceous, with three transverse black short bands abbreviated at each end, the basal one in shape of a large subquadrate patch placed on the shoulders, the second one, the narrowest, placed at the middle, and the third near the apex; under side black, the last three abdominal segments and the legs testaceous, the extreme apex of the posterior femora and the base of their tibiæ black.

Hab. Rio de Janeiro.

OEDIONYCHIS GRAYI, sp. n.

Dark fulvous below; clypeus and thorax flavous, base of the head black, anterior angles of thorax mucronate, the latter impunctate; elytra very finely and closely punctured, flavous, a broad transverse band at the base and another below the middle, not extending to the margins, dark violaceous, posterior edge of the second band rounded.

Length $6\frac{1}{2}$ millim.

Head impunctate, the vertex black, frontal tubercles narrowly transverse, flavous, as well as the clypeus, labrum, and the palpi; antennæ short, not extending to the middle of the elytra, dark fulvous, the basal joint thick, subcylindrical, widened at the apex, the third joint twice as long as the second but shorter than the fourth joint, the following joints about as long as the third; thorax narrowed anteriorly, about twice and a half broader than long, the sides nearly straight, the lateral sulci not deeply separated from the disc, anterior angles mucronate, the surface convex, impunctate, flavous; scutellum blackish; elytra rounded and widened towards the middle, narrowly margined, the shoulders with a short, moderately deep impression within, the surface finely but distinctly and very closely punctured, the dark bands very wide, the dividing spaces narrow, the lateral margins likewise narrowly flavous, the posterior band rounded at its apical margin, leaving the suture for a little way upwards and the apex of the elytra somewhat more broadly flavous; under side and legs fulvous.

Hab. Amazons (*Bates*).

The single specimen contained in my collection was obtained by Bates, but bears no special locality. The species differs from

O. cardinalis in the coloration of the head and the antennæ, in the scarcely rounded sides of the thorax, and in the shape of the posterior elytral band. The same differences separate the species from others nearly similarly marked.

This is one of the most difficult sections of the genus, as the amount of variation in regard to the elytral bands, their shape and size, can only be ascertained where sufficient material is at hand; neither coloration nor sculpture can always be relied upon in these insects.

OEDIONYCHIS ARCUATA, sp. n.

Black, the head bluish; clypeus flavous; thorax impunctate, flavous; elytra closely and distinctly punctured, flavous, a broad transverse band at the base, a transverse large spot below the middle, and the apex metallic blue.

Length 6 millim.

Head bluish black, strongly punctured at the sides above the eyes, frontal elevations broadly transverse; clypeus flavous; antennæ black, third joint scarcely shorter than the fourth, terminal joints rather robust and short; thorax more than twice as broad as long, the sides with a deep but not very broad sulcus, anterior angles strongly thickened but scarcely produced, the lateral margins rounded anteriorly, straight at the base, the disc very finely punctured when seen under a strong lens, flavous, the base with a very obsolete transverse sulcus; scutellum black; elytra with very narrow reflexed lateral margins, not depressed below the base, very closely and more or less strongly punctured, the anterior half of their length occupied by a transverse blue band not extending to the lateral margins, its posterior edge concave, immediately below the middle is another large transverse band which has its anterior margin convex and the posterior one rounded, the extreme apex of each elytron is likewise metallic blue; under side and legs black.

Hab. Colombia.

Evidently closely allied to *O. labiata* Schauf., but the fourth joint of the antennæ in that species is described as the longest; the elytra are described as nearly smooth, and the first transverse band as being interrupted at the suture; the same is the case with the second band, which is said to be composed of two spots.

OEDIONYCHIS BIPARTITA, sp. n.

Broadly ovate, convex, black, the clypeus and the thorax fulvous, the latter very minutely punctured, the angles mucronate; elytra extremely closely and finely punctured, flavous, a transverse band at the base, another one at the middle, and a third near the apex, bright metallic green.

Length 7–8 millim.

Head black, impunctate, diameter of each eye about as wide as the dividing space, clypeus fulvous, frontal elevations narrowly transverse; antennæ long and slender, black, the lower three joints more or less piceous below, third joint shorter than the fourth, intermediate joints slightly widened; thorax more than twice as broad as long, the sides strongly rounded and deeply sulcate, anterior angles distinctly produced into a tooth, the disc fulvous, minutely punctured when seen under a very strong lens; scutellum black, broad; elytra widened towards the middle, testaceous, with three metallic green transverse bands which do not extend to the lateral margins; of these bands, which are all connected with each other at the suture, the first is of somewhat irregular shape and does not extend to a third of the length of the elytra, its posterior edge is irregularly serrate, the second band at the middle is broader (in a longitudinal sense) and of more regular shape, the third band is again narrow and more or less curved and does not extend to the apex, which remains of the ground-colour; below and the legs black, metatarsus of the posterior legs shorter than the following two joints together, claw-joint strongly swollen.

Hab. Pachitea, Peru.

A handsome species, distinguished by the three bright metallic green elytral bands.

OEDIONYCHIS ILLUSTRIS, sp. n. (Dej. i. litt.) (Plate XV. fig. 11.)

Testaceous, the legs dark fulvous; thorax short, impunctate; elytra convex, scarcely perceptibly punctured, a broad transverse band at the base, another below the middle, not extending to the suture, and the apex purplish violaceous.

Length 8 millim.

Head impunctate, the vertex obscure purplish, the rest of the face testaceous; clypeus strongly raised in shape of a triangular ridge; eyes large; antennæ piceous, the basal joint testaceous below, third joint shorter than the fourth; thorax short and transverse, the sides broadly flattened, the anterior angles produced but scarcely dentiform, the surface impunctate, testaceous; scutellum black; elytra widened towards the middle and convex, extremely minutely punctured, flavous, with two transverse broad purplish bands—the first at the base, not quite extending to the middle nor to the lateral margins, the second, in shape of a transversely subquadrate band, not extending to either margin, another triangular spot occupies the apex; all these bands are separated by nearly equal narrow spaces of the flavous ground-colour, but the basal band extends across the suture; under side and the base of the anterior and intermediate femora testaceous, the rest of the legs and the posterior femora dark fulvous.

Hab. Cayenne.

A species of broadly ovate shape and resembling in its markings *O. bitæniata* Baly, but in that species the second elytral band extends to the suture, all are of much more narrow shape, and dull blue instead of metallic purple.

OEDIONYCHIS ILLIGERI, sp. n.

Piceous; thorax flavous, anterior angles not mucronate; elytra closely punctured, flavous, a transverse band at the base, emarginate within the shoulders, a narrower band below the middle, and a triangular spot near the apex, dark fulvous or piceous.

Var. The posterior elytral markings joined.

Length 5–6 millim.

Of short and ovately rounded shape; the head with some deep punctures near the eyes, the vertex piceous, clypeus flavous, eyes well separated, frontal tubercles oblique, rather short; antennæ short, fulvous or black, the third, fourth, and fifth joints equal; thorax strongly transverse, more than twice as broad as long, the sides broadly sulcate, rounded in front, the anterior angles not mucronate but thickened, the surface impunctate, flavous; elytra finely and closely punctured, with three transverse dark fulvous bands—the first at the base, nearly extending to the middle and notched at its anterior margin within the shoulders, the second narrower band below the middle and immediately followed by a triangular spot; neither of the bands extends to the lateral or sutural margins, and they are sometimes tinged with an æneous gloss; metatarsus very short, claw-joint strongly swollen.

Hab. Trinidad.

I possess four specimens of this species, which is of rather small size, and may be known by the shape of the anterior elytral band, which in all cases is notched at the base, and by the position of the posterior bands, which sometimes form but a single broad one.

OEDIONYCHIS DISSEPTA Erichs.

This is evidently a very variable species in size as well as in the markings of the elytra. Erichson has described two varieties, but I have before me others. In the type the elytra have a broad transverse, nearly black band at the base and another one near the apex; this latter band is often reduced to an oval spot, or may be absent altogether; in another form which I received from Marcapata, Peru, together with typical specimens, the thorax has two blackish spots at the middle; then there is a third variety, in which the bands are very much broader and only separated by a very narrow transverse flavous band at the middle. No other structural differences are visible, in spite of a very careful examination, nor do the male genitalia of these varieties show any difference whatever. In all the specimens the clypeus, thorax, and the lateral elytral margins remain flavous, the punctuation is extremely fine, the sides of the thorax are nearly straight and are produced anteriorly into a small tooth. *O. signifera* Baly and *O. 5-maculata* Jac., likewise from Peru and Bolivia, seem to be nothing but other varieties in which the elytral markings are reduced to spots; they cannot otherwise be distinguished. M. Clavareau, of Brussels, has sent me specimens obtained in the Province Huallaga, Peru, which again differ in having the elytral band of a golden coppery tint and fulvous head and antennæ. I am, however, unable to see anything more in these differences than one of colour.

OEDIONYCHIS IMPERIALIS, sp. n.

Pale piceous below, the head, antennæ, and thorax pale fulvous; elytra very closely and finely punctured, purplish-violaceous, the lateral and apical margins and a narrow transverse band at the middle flavous.

Length 9 millim.

Head flavous, impunctate; the frontal elevations broad, contiguous; clypeus strongly raised into a triangular ridge, the anterior edge of which is very prominent; antennæ pale fulvous, the third joint one-half shorter than the fourth (the terminal two joints wanting); thorax more than twice as broad as long, the lateral margins strongly rounded anteriorly, the anterior angles thickened but not dentiform, the sides broadly flattened, the surface minutely and rather closely punctured, pale flavous; scutellum obscure fulvous; elytra widened towards the middle, convex, with narrow reflexed lateral margins, the shoulders prominent, the surface extremely closely and finely punctured throughout, purplish violaceous, a narrow straight transverse band at the middle and the lateral and apical margins (the latter slightly more widely so) flavous; under side and legs pale piceous.

Hab. Yurimaguas, Peru.

This species differs from *O. steinheili* Jac. (Proc. Zool. Soc. 1880, p. 179) in the pale-coloured antennæ, in the differently shaped anterior angles of the thorax, and in the narrow and straight, flavous band of the elytra; the larger size and colour of the elytra separate the species from other nearly similarly marked species, as well as from *O. bifasciata* Baly, which has also differently coloured antennæ and a black apex to the posterior femora.

OEDIONYCHIS OCCIPITALIS, sp. n.

Testaceous, the base of the head and the terminal joints of the antennæ black; thorax impunctate; elytra microscopically punctured, testaceous, a transverse band at the base connected at the suture with another broad band below the middle, black; the breast, abdomen, and the posterior tibiæ more or less piceous or black.

Var. *a.* The elytral bands not connected at the suture.

Var. *b.* Elytra with a spot near the scutellum and an elongate larger spot below the middle, black.

Var. *c.* Elytra entirely testaceous.

Length 4–5 millim.

Head impunctate, black at the vertex, the lower portion testaceous, frontal elevations broad, eyes large; antennæ slender, the lower four or five joints testaceous, the others piceous, third and fourth joints equal; thorax scarcely more than twice as broad as long, the sides with well-marked flattened margins, feebly rounded, anterior angles not produced, the surface impunctate, testaceous; scutellum piceous; elytra visibly punctured only when seen under a very strong lens, with narrow flattened margins, testaceous, with two transverse nearly black bands, the first at the base, of somewhat triangular shape, and connected at the suture with another broader band below the middle, not extending to the apex, neither of the bands extends quite to the lateral margins; breast and abdomen black, legs testaceous.

Hab. Bolivia.

A small and very variable species, in which the nearly black vertex of the head seems to be the only constant character so far as coloration is concerned. The description is based on a specimen in which the elytral bands are mostly developed; the elytra in this form may be described as black, with the lateral and apical margins, as well as a slightly oblique transverse band at the middle, testaceous, this band not extending to the suture; in this specimen the posterior tibiæ and tarsi are black. In the var. *a* the dark bands are smaller and disconnected, and the posterior one is in shape of an oblong patch on each elytron; in var. *b* there is only a black spot near the scutellum and an elongate larger one placed near the suture below the middle; while in var. *c* the elytra are entirely unspotted. In all these forms, however, the base of the head and the underside remain black.

OEDIONYCHIS ÆNEA, sp. n. (Clark, MS.).

Fulvous; thorax flavous, the sides broadly sulcate; elytra very convex and strongly widened at the middle, minutely punctured, a transverse band at the base and another one, narrowed at the suture and not extending to either margin, violaceous blue.

Length 8 millim.

Head fulvous, impunctate, frontal elevations narrow and transverse, carina acute, eyes not closely approached; antennæ with the third joint much shorter than the fourth, fulvous (the other joints wanting); thorax more than twice as broad as long, the sides strongly rounded and broadly sulcate, the anterior angles slightly mucronate and strongly thickened, posterior margin sinuate at each side, the disc impunctate, flavous; scutellum fusco-violaceous; elytra strongly widened and convex, flavous, with a broad transverse band at the base not extending to the lateral margins, of violaceous-blue colour, but more or less dark fulvous when viewed sideways, another band, rather suddenly widened at its outer end, is placed below the middle but does not extend to either margin; the flavous portion separating these bands is of about the same width as the bands themselves; breast and the femora dark fulvous, tibiæ and tarsi flavous; metatarsus very short, claw-joint strongly swollen.

Hab. Ega, Amazon (*Bates*).

The description of this species is based on a specimen named by Clark, and formerly in the Baly collection. The colour of the elytral bands, their shape, and the more than usually convex and widened general shape of the insect, distinguish this species. Whether *O. jaculus* Illig. is identical with this or some other similarly marked species I am unable to say, but Illiger's description of the shape of the elytral bands does not agree with that of the insect before me.

OEDIONYCHIS REGINA, sp. n. (Plate XIV. fig. 12.)

Large and broad, black, the last two joints of the antennæ pale yellow; thorax impunctate, flavous, with a large black transverse band; elytra strongly and very closely punctured, metallic dark green; the lateral margins and a transverse band below the middle testaceous.

Length 10 millim.

Head bluish-black, impunctate, except near the eyes, the latter with a flavous spot near the inner margins, widely separated; antennæ slender, black, the last two joints pale flavous, third joint slightly shorter than the fourth; thorax rather more than twice as broad as long, the sides broadly flattened, evenly rounded, the anterior angles thickened, very slightly produced outwards, the disc impunctate, black, the lateral and basal margins flavous; scutellum black; elytra widened below the middle, closely and strongly rugose-punctate, metallic green, the lateral margins narrowly and a slightly wider transverse band, immediately below the middle, testaceous; under side and legs black.

Hab. Espirito Santo, Brazil.

The black thoracic band which extends to the anterior margin, the colour of the antennæ, and the strongly punctured elytra well distinguish this species from any other.

OEDIONYCHIS DIFFICILIS, sp. n. (Clark, MS.).

Black, thorax flavous, impunctate; elytra convex, widened posteriorly, closely and finely punctured, flavous, a broad transverse band at the base and another band below the middle, with the lateral and posterior margins rounded, metallic blue, both bands not extending to the margins.

Length 6–9 millim.

Head impunctate, black, two or three deep punctures are placed near the eyes, frontal tubercles trigonate, nearly connected; antennæ rather long, black, the base at their insertion flavous, third and fourth joints nearly equal; thorax twice as broad as long, the sides rounded anteriorly, the anterior angles produced into a small tooth, the disc impunctate, flavous or fulvous; scutellum black; elytra widened towards the middle, convex, finely and closely punctured, flavous, with two transverse dark blue bands—the first at the base, of regular shape, with its posterior edge straight and not quite extending to the middle, the second band below the latter, its anterior margin straight, but the lateral and apical margins rounded, the last-named sometimes slightly concave near the suture, both bands do not quite extend to the lateral margins of the elytra; under side and legs black, the apex of the abdomen sometimes more or less fulvous; prosternum longitudinally carinate at the middle.

Hab. Peru.

The characteristic feature of this species, by which it may be principally distinguished from the many similarly coloured ones, is the shape of the elytral blue posterior band, of which the posterior edge is broadly rounded instead of straight; the flavous band which separates the blue ones at the middle is generally, but not always, of about the same width as that of the basal dark band, sometimes broader. *O. alacris* Erich. and *O. promta* Erich. are described with black not blue bands, and the former with the head rufous, the other with a broad median flavous band; other details are not given. The eight specimens before me show no variation of any importance, but I may add that the posterior elytral band is in all cases broader (in a longitudinal sense) than the anterior one.

OEDIONYCHIS COLOMBIANA, sp. n.

Black, the clypeus and the thorax flavous, the latter impunctate; elytra with a few punctures near the base, flavous, a broad band at the base, another at the middle, and the extreme apex metallic blue; abdomen fulvous.

Length 7 millim.

Head bluish black, impunctate, frontal elevations small, transverse, clypeus flavous, carina short and thick; antennæ with the lower and the terminal three joints dark fulvous, the intermediate ones piceous, third joint much shorter than the fourth; thorax impunctate, flavous, the sides deeply sulcate, especially so near the anterior angles which are thickened but not produced, near the base is a very shallow transverse sulcation; scutellum black; elytra extremely finely punctured, with some more distinct punctures near the suture and within the shoulders, flavous, a broad transverse band at the base, not extending downwards to the middle nor to the lateral margins, another band immediately below the middle but of more rounded shape, and the extreme apex metallic blue; breast and legs black, the abdomen and the tarsi more or less fulvous.

Hab. Colombia. (Collection H. Clavareau and my own.)

Closely allied to *O. bipunctata* Chev. (*insularis* Jac.), but the head impunctate, the frontal elevations black, not flavous, and the elytra extremely finely punctured, the posterior band broader, not in shape of a round spot.

OEDIONYCHIS SUCCINCTA, sp. n.

Black, antennæ fulvous; thorax flavous, with an æneous short band at the middle of the anterior margin; elytra flavous, a broad transverse band at the base and another below the middle black, nearly impunctate.

Length $6\frac{1}{2}$ millim.

Head impunctate, the vertex black, the clypeus flavous, frontal elevations scarcely indicated, eyes widely separated, labrum and palpi flavous; antennæ fulvous, the first joint piceous above, third joint shorter than the fourth; thorax strongly transverse, the sides strongly rounded, the anterior angles very prominent and pointed, the lateral sulci narrow, somewhat interrupted anteriorly, not well separated from the discoidal portion, the surface impunctate, flavous, with a transverse short black band at the middle of the anterior margin; elytra with narrowly reflexed margins, extremely minutely punctured when seen under a strong lens, flavous, with two broad transverse black bands, one at the base, the other below the middle, the latter band shorter than the basal one (in a longitudinal sense), neither band extends to the lateral margins and the flavous space separating them is narrow and perfectly regular in shape; below and the legs black.

Hab. Bolivia.

The thoracic spot or band placed at the middle of the anterior margin and the regular shape and black colour of the elytral bands distinguish this species, of which I know only a single specimen.

Oedionychis weisei, sp. n.

Flavous, the base of the head, the antennæ, and the breast and legs black; thorax impunctate; elytra finely and closely punctured, the basal margin and a transverse narrow band below the middle dark metallic blue.

Length 8 millim.

Head with a few fine punctures, black, the clypeus flavous; eyes large, the diameter of each as wide as the intermediate space; frontal elevations oblique, strongly raised, bounded by a deep fovea behind; antennæ scarcely extending to the middle of the elytra, black, the third and fourth joints equal; thorax twice as broad as long, somewhat narrowed anteriorly, the lateral margins strongly rounded, the anterior angles distinctly produced into a tooth, the sides deeply sulcate, the surface impunctate, except when seen under a very strong lens, when some minute punctures are visible, flavous; scutellum black; elytra convex, elongate, but slightly widened at the middle, very finely and closely punctured, the extreme base as far as the shoulders and a narrow band below the middle, not quite extending to the lateral margins, violaceous blue; below and the legs black, abdomen fulvous.

Hab. Colombia.

Much larger than *O. colombiana*; the bands of the elytra blue, the spot near the scutellum absent, and the thorax of entirely different shape; the legs black.

Oedionychis selecta, sp. n.

Pale fulvous; elytra extremely minutely and closely punctured, a broad transverse band at the base and another below the middle, connected at the suture, metallic green.

Length 9 millim.

Head fulvous, with a few punctures near the eyes, the clypeus with a strongly raised, central carina, eyes large; antennæ long and slender, third joint shorter than the fourth; thorax more than twice as broad as long, the sides strongly rounded, broadly flattened; the disc very convex, very minutely punctured when seen under a strong lens, fulvous; scutellum broad, fulvous; elytra convex, scarcely widened at the middle, with a shallow transverse depression below the base, extremely finely punctured, the punctures of different sizes, with two very broad, transverse, metallic green bands, the first at the base not extending to the margins but nearly to the middle, the second band immediately below the latter, of nearly the same width and not extending to the apex; these bands are therefore separated by a narrow transverse and straight band of the ground-colour which does not quite extend to the suture and rounded at its inner termination; under side and legs fulvous.

Hab. Amazons.

Of more parallel shape than *O. ænea*, and distinguished from that and other similarly marked species by the bright metallic-green bands of the elytra, separated at the middle by a straight narrow fulvous band which does not extend quite to the suture; in *O. bipartita*, which has similarly coloured metallic bands, these are divided *before* and *below* the middle.

OEDIONYCHIS CARDINALIS, sp. n. (Clark, MS.).

Piceous, head and thorax flavous, the latter narrowed in front; elytra microscopically punctured, flavous, a broad transverse band at the base and another of more rounded shape below the middle, violaceous blue.

Length 10 millim.

The principal differences which separate this species from many similarly coloured forms are to be found in the large general size, anteriorly narrowed thorax, and the shape of the elytral bands; the eyes are well separated, and the head is sparingly and finely punctured; the frontal elevations and the carina are proportionately broad; the antennæ have very slender and elongate joints, the lower three are fulvous, the rest black (in the British Museum specimen, named by Clark, the antennæ are entirely fulvous). The thorax is less transverse than in many other species, distinctly narrowed anteriorly, with strongly rounded sides, the anterior angles are blunt above, but have a short projection below the margin in front of the eyes; the lateral sulci are rather broad and shallow; the scutellum is flavous; the punctuation of the elytra can only be seen with a very strong lens; of the blue elytral bands, the first extends nearly to the middle and has its posterior margin straight or nearly so, in the second band the anterior and posterior margins are rounded, so that the flavous portion separating both bands is slightly widened at the suture, the extreme lateral margins and a small triangular space at the apex are of the ground-colour; the under side and legs are dark fulvous or piceous, and the posterior femora have the apex broadly stained with blackish. *O. steinheili* Jac. is a much broader insect with a differently shaped thorax.

Hab. Amazons.

Oedionychis fulvotibialis, sp. n.

Obscure piceous below, the clypeus, antennæ, and the tibiæ more or less fulvous; thorax flavous, impunctate; elytra closely and finely punctured, metallic greenish, the lateral margins and a narrow transverse band at the middle flavous.

Length $5\frac{1}{2}$ millim.

Head at the vertex and the frontal elevations greenish, impunctate, a narrow space round the eyes and the clypeus and labrum flavous, frontal elevations subquadrate; eyes large, with a rather deep, punctured sulcus near the inner margins; carina short and blunt; antennæ fulvous, the third joint slightly shorter than the fourth; thorax strongly transverse, the lateral margins straight at the base, rounded in front, the sides deeply flattened, anterior angles not prominent but thickened, the disc impunctate, flavous; scutellum black; elytra slightly widened at the middle, very finely punctured except within the shoulders, where there is a short row of deeper punctures, the lateral margins and a narrow transverse band at the middle flavous, rest of the surface metallic dark green, this colour forming two subquadrate patches on each elytron which extend across the suture; below and the legs piceous, the apex of the posterior femora and the tibiæ and tarsi more or less fulvous; the metatarsus very short.

Hab. Bolivia.

A rather small species, and at once distinguished by the colour of the antennæ and tibiæ.

Elytra with longitudinal bands.

Oedionychis vittatipennis, sp. n.

Broad and elongate, flavous; apical joints of the antennæ black; thorax strongly transverse, impunctate; elytra very finely and extremely closely punctured, flavous, the suture, a subsutural and a submarginal longitudinal stripe, connected at the apex, ferrugineous.

Length 10 millim.

Head impunctate, flavous, eyes large, frontal elevations strongly raised, trigonate; antennæ filiform and slender, black, the lower three or four joints testaceous, third and fourth joints equal; thorax twice as broad as long, the sides rounded, broadly flattened, the anterior angles produced into a small tooth, the surface impunctate, flavous; elytra with very close and fine but distinct punctuation, the suture very narrowly and two longitudinal broader stripes, of which one is placed near the suture, the other near the margin, reddish-fulvous, these stripes are united at the apex but do not extend to that portion of the elytra; under side and legs pale flavous.

Hab. Brazil.

Of this large species three specimens are contained in my collection. Amongst the longitudinally banded species described by von Harold in the Berl. ent. Zeit. 1881, there is none which can be compared in size with this species, and all similarly coloured forms have but one elytral stripe instead of two. *O. tæniolata* Har. has the eyes widely separated, a small thorax, and narrow elytral epipleuræ, and is much smaller.

OEDIONYCHIS ADJUNCTA, sp. n. (Plate XV. fig. 12.)

Black; thorax impunctate, the margins flavous; elytra impunctate, a subsutural vitta, the lateral margins, and a short transverse band near the apex, connecting the stripes, flavous.

Length $5\frac{1}{2}$ millim.

Head broad, black, closely and strongly punctured in front of the eyes, the latter small, very widely separated; antennæ very short, the joints moniliform; thorax twice as broad as long, the lateral margins strongly thickened, narrowly sulcate in front, the anterior angles thickened, slightly produced, the disc impunctate, black, all the margins narrowly flavous; scutellum black; elytra without any perceptible punctuation, black, with the lateral margins and a narrow longitudinal stripe at the disc flavous; this stripe extends from the middle of the base to the apex and approaches slightly the suture below the middle, near the apex it is connected with the flavous margin by another oblique transverse thin stripe; below and the legs black.

Hab. Bolivia.

Amongst the species with pale longitudinal stripes, the present one seems most nearly allied to *O. haagi* Har. in colour and pattern, but differs in the entirely impunctate thorax and elytra.

OEDIONYCHIS DONCKIERI, sp. n.

Elongate and parallel, the head fulvous; antennæ and breast more or less black; thorax flavous, impunctate; elytra finely punctured, obscure flavous, a sutural and a discoidal longitudinal band black; legs dark fulvous.

Length 7 millim.

Head rugosely punctured above the eyes, fulvous; frontal elevations strongly raised, broadly trigonate; clypeus short and broadly convex between the antennæ; the latter robust, extending to the middle of the elytra, black, the basal two joints piceous, third and fourth equal, the terminal joints more elongate; thorax rather more than twice as broad as long, not or scarcely narrowed in front, the sides rounded, with a well-marked sulcus, the anterior angles acute but not produced, the disc transversely grooved near the base, impunctate, flavous, rather opaque scutellum black; elytra of elongate shape, minutely and obsoletely punctured, flavous; the suture and a discoidal longitudinal stripe, both abbreviated near the apex, black; under side obscure blackish, the legs dark fulvous, the tibiæ rather darker, prosternum pale.

Hab. Tasco, Mexico.

Of this species, one of the most elongated of the genus, I received a single specimen from M. Donckier of Paris; the elytral sutural stripe is of narrower shape than the discoidal one.

Elytra blue or black, with flavous lateral and apical margins.

OEDIONYCHIS CINCTIPENNIS, sp. n.

The head, breast, and legs black; thorax fulvous, impunctate; elytra convex, widened posteriorly, metallic blue, closely and distinctly punctured, the lateral and apical margins fulvous; abdomen partly flavous.

Length 7 millim.

Strongly convex and widened posteriorly; the head black with bluish gloss, with a few punctures near the eyes; antennæ black, the lower three joints fulvous below, third and fourth joints equal; thorax with the lateral margins strongly rounded anteriorly, the sides broadly flattened, the disc convex, impunctate, fulvous; scutellum black; elytra widened below the middle, with a short but deep depression within the shoulders, very closely and rather strongly punctured, metallic blue, the lateral margins narrowly and the apex rather more broadly so, fulvous; under side and legs black, the sides of the abdomen more or less fulvous or flavous.

Hab. Peru.

From other similarly coloured species, the present one is distinguished by the posteriorly widened shape and the distinct and close punctuation of the elytra; the latter have in some specimens a very small fulvous spot placed near the suture at the middle, the fulvous margin widens slightly and gradually near the apex, the latter part is also entire, not serrulate as in *O. sagulata* Erichs.

OEDIONYCHIS PALLIDICINCTA, sp. n.

Obscure piceous below, the thorax and legs flavous; tibiæ and tarsi and the apex of the posterior femora black; thorax impunctate; elytra black, entirely impunctate, the extreme lateral and the apical margins more broadly, flavous.

Length $5\frac{1}{2}$ millim.

Of rather flattened shape; the head nearly black, impunctate, deeply transversely grooved between the eyes, the latter very large, frontal elevations broad, transverse; antennæ rather robust, black, the lower two joints and the last one fulvous, third and fourth joints equal; thorax twice as broad as long, the sides rather rounded, deeply sulcate, with strongly reflexed and thickened margins, the anterior angles not produced, the surface impunctate, flavous; scutellum black; elytra shining, black or nearly so, impunctate, the extreme lateral margins and epipleuræ and the apex more broadly flavous; femora flavous; the under side, tibiæ and tarsi piceous, the apex of the posterior femora black.

Hab. Espirito Santo, Brazil.

A rather small species, not difficult to distinguish, of which I possess two specimens.

OEDIONYCHIS SEMIFOVEOLATA, sp. n. (Plate XV. fig. 5.)

Black, the thorax and abdomen flavous; elytra dark purplish, the disc with longitudinal rows of elongate foveæ, the sides narrowly and the apex broadly flavous.

Length 9 millim.

Head black, impunctate, frontal elevations rather broad; carina acute, black, clypeus flavous at the sides; antennæ black, the basal joint flavous below, third joint shorter than the fourth; thorax more than twice as broad as long, narrowed anteriorly, the sides rounded, with a broad, flattened margin, the anterior angles produced into a tooth, the surface convex, impunctate; scutellum black; elytra dark metallic purplish, margined at the sides and apex with flavous, at the first named place narrowly so, at the latter suddenly widened into a broad band the anterior edge of which is quite straight, the disc impressed with distant, elongate and partly round greenish foveæ, which are placed in rows, interstices entirely impunctate; under side and legs black, abdomen flavous.

Hab. Venezuela.

Closely allied to *O. porosa* Baly, but the elytra of different sculpture, the foveæ isolated and placed in rows, and the abdomen flavous. A single specimen is contained in my collection.

In Duvivier's Catalogue *O. porosa* Baly is given as a synonym of *O. variolosa* Harold, but this requires confirmation, since the size of Baly's species is from 3½–4 millim., while Harold gives 11 millim as the length; Duvivier, moreover, has only given a short diagnosis, which in these closely allied and numerous groups of insects is quite useless.

OEDIONYCHIS PRETIOSA Baly.

The locality of this species as given by the author is *Brazil*, not *Siam* as stated in Duvivier's Catalogue, 1885.

OEDIONYCHIS CUBANA Harold.

Coleopter. Hefte, xiii. p. 90: Cuba.

This species is not mentioned in any of the Catalogues.

OEDIONYCHIS FLAVOMARGINATA, sp. n. (Plate XV. fig. 9.)

Black, thorax impunctate, the sides broadly flavous; elytra convex, finely and closely punctured, black, the lateral margins narrowly and the apex more broadly flavous.

Length 6–7 millim.

Head with some punctures at the vertex, black, the eyes more or less margined with flavous within and with some distinct punctures; antennæ not extending to the middle of the elytra, black, third and fourth joints equal; thorax scarcely twice as broad as long, the lateral margins straight at the base, rounded in front, the anterior angles produced into a tooth, the sides broadly flattened, flavous, the middle of the disc in shape of an anteriorly narrowed broad band, black, impunctate; elytra rather broad, very closely and finely but distinctly punctured, black, the lateral margins narrowly flavous, this colour widened at the apex into a spot which does not quite extend to the suture; under side and legs black or piceous.

Hab. Espirito Santo, Brazil.

Distinct in its coloration from any other species of the genus known to me; two specimens are before me.

Elytra pale, with small black spots.

OEDIONYCHIS BIPUNCTULATA, sp. n.

Testaceous above, the under side and legs darker; thorax impunctate, with broadly flattened sides; scutellum piceous; elytra very finely and closely punctured, each with a small black spot below the middle.

Length 6 millim.

Vertex of the head stained with piceous, with a central groove and bilobed in front, frontal tubercles short and broad; clypeus convex; antennæ with the lower three joints flavous, the following four black, the rest wanting; thorax strongly transverse, of very even width, the sides straight at the base, rounded anteriorly, broadly flattened, anterior angles thickened, oblique but scarcely produced outwards, the disc impunctate, testaceous, obsoletely depressed in front of the scutellum, the latter triangular, nearly black; elytra strongly convex, nearly parallel, with a short row of deeper punctures within the shoulders, the rest very finely and closely punctured, below the middle a small black spot is placed, halfway between the lateral and sutural margins; under side and femora fulvous; prosternum narrowly elongate, rather convex.

Hab. Prov. Tucuman, Argentine Rep. (*C. Bruch*).

In the markings of the elytra and general coloration this species resembles *O. complanata* Suff., from Cuba, but the latter is smaller, much more depressed in shape, and has impunctate elytra.

OEDIONYCHIS TRILOBA, sp. n.

Elongate, testaceous; head and thorax impunctate, the latter with two trilobed black spots; elytra not perceptibly punctured, each elytron with three black spots, two at the base and one at the middle, the extreme sutural margins from the middle to the apex black.

Length 6 millim.

Head impunctate, frontal elevations broad, well marked, carina very convex and prominent, eyes very large; thorax twice as broad as long, the sides broadly flattened, the lateral margins rather rounded near the base, gradually narrowed anteriorly, anterior angles produced into a small tooth, the surface impunctate, with a transverse depression at the sides near the base, testaceous, the sides with a trilobate black spot, the middle lobe pointed upwards; elytra nearly parallel, with a feeble depression below the base, impunctate, a round black spot on the shoulders, another near the scutellum, and a third spot of transverse shape at the middle, as well as the sutural margins from below the base to the apex, black; under side and legs testaceous.

Hab. Peru.

I know only a single specimen of this species and am not aware therefore if the markings of the elytra are subject to variation, which is probably the case. The species has the frontal carina, however, much more strongly raised than most of its allies, the elytral spots are comparatively large and deep black; this and the similarly coloured suture will assist in the recognition of the species.

Oedionychis basinotata, sp. n. (Plate XV. fig. 4.)

Piceous, the base of the head and a transverse band at the thorax bluish-black; elytra strongly and closely punctured, with four black spots, placed obliquely at the base in a semicrescent.

Length 6 millim.

Head strongly punctured near the eyes, fulvous, the vertex bluish-black, frontal elevations robust, oblique, carina short and broad; eyes large, each as broad as the dividing space; antennæ scarcely extending to the middle of the elytra, black, the lower three joints more or less flavous below, third joint thinner but as long as the fourth; thorax twice as broad as long, the lateral margins straight at the base, rounded anteriorly, the anterior angles produced into a strong tooth, the sides deeply sulcate and flattened, surface with a few minute punctures, the entire disc bluish-black, the margins fulvous; scutellum black; elytra not depressed below the base and scarcely so within the shoulders, closely and strongly punctured, each with two bluish-black spots at the base placed transversely, the outer one transverse, the inner of more elongate shape; below and the legs nearly black; metasternum raised anteriorly.

Hab. Paraguay.

This beetle differs in the markings of the elytra from any other described species.

Oedionychis maculatissima, sp. n.

Ovate, convex, dark fulvous below, vertex of head piceous; antennæ and thorax fulvous, the latter with two transverse, black spots; elytra rather strongly punctured, pale fulvous, with ten spots each (3.3.2.2).

Var. Thorax without spots; elytra greenish-black, the sides and apex rather broadly fulvous.

Length 6 millim.

Of rather short, broadly ovate and convex shape, the head with a few punctures near the eyes, the latter large, each as wide as the intermediate space, the vertex piceous, lower portion fulvous, frontal tubercles narrowly transverse; antennæ extending to the middle of the elytra, fulvous, the third and fourth joints very nearly equal, following joints rather stout and not longer than the fourth; thorax more than twice as broad as long, of equal width, the sides rounded anteriorly, straight at the base, anterior angles prominent with a small tooth, lateral sulci deep and broad, the surface impunctate, fulvous, with a short transverse black band or spot at each side; elytra narrowly margined, rather strongly punctured, fulvous, each with ten black spots, of which three are placed transversely at the base, three below these before the middle, two larger ones nearly connected below the middle, and two others well separated near the apex, there is also another obscure spot placed at the apex on the suture; under side and legs dark fulvous; metatarsus of posterior legs very short, claw-joint strongly swollen.

Hab. Bolivia.

I cannot identify this species with *O. fenestrata* Har., to which it is no doubt closely allied. Von Harold, who gives no details in regard to the shape of the thorax, describes his species as having black antennæ and under side, as well as similarly coloured legs and the elytra with 9 spots only; the thorax also is said to have a single band, not two spots, and the third joint of the antennæ to be distinctly shorter than the fourth: none of these details applies to the present insect. The variety, which at first sight entirely differs in coloration, agrees in every structural detail and also in the colour of the antennæ and under side; there is also a widening of the fulvous band at the sides corresponding with the fulvous space which separates the spots as in the type, and the greenish-black colour likewise is the same in the spotted form, although which of the two may be looked upon as the type is optional.

OEDIONYCHIS DUODECIMNOTATA (Clark, MS.), sp. n. (Plate XIV. fig. 11.)

Testaceous, the terminal joints of the antennæ black; the head and thorax with two black spots, closely punctured; elytra very closely and strongly punctured, the basal margin and five spots on each elytron black; under side black, legs testaceous.

Length 10 millim.

Head with a few deep punctures, flavous, shining, the vertex with two black spots, frontal tubercles bounded behind by a deep groove, labrum black; antennæ slender, testaceous, the terminal six joints black; thorax with strongly produced anterior angles, the lateral margins feebly rounded, the disc broadly flattened at the sides, closely and distinctly punctured, testaceous, with a large black spot at each side; scutellum black; elytra very broad and rather flattened, evenly, closely, and strongly punctured, the basal margin very narrowly and five spots on each elytron black: of these, one of transverse shape is placed before the middle, two obliquely below the middle, and two others near the apical margin; breast and abdomen black, the last segment and the legs testaceous, the posterior femora with a black spot at the apex.

Hab. Brazil.

Allied to *O. nigromaculata* Sturm, but differing in the black basal elytral margin and the different position of the spots, also in the colour of the antennæ.

OEDIONYCHIS PERSIMILIS, sp. n.

Elongate, testaceous; thorax impunctate, the anterior angles mucronate; scutellum black; elytra not perceptibly punctured, with five black small spots on each (1.2.1.1).

Length 6 millim.

Head impunctate, the eyes rather widely separated, frontal tubercles broadly subquadrate, carina short and rather blunt; antennæ scarcely reaching to the middle of the elytra, testaceous, the third and following joints nearly equal; thorax more than twice as broad as long, the sides rounded, the anterior angles slightly produced outwards into a small tooth, the lateral sulci deep, the surface impunctate, obsoletely depressed in front of the scutellum, the latter black; elytra obscure testaceous, each with five small black spots, of which one is placed on the shoulders, two before the middle obliquely, the inner one near the suture, the fourth spot below the middle near the lateral margin, and the fifth below the sutural spot at some distance from the apex; under side and legs testaceous, the posterior femora with a black spot at the upper edge.

Hab. Chilpancingo, Mexico.

Of more elongate shape than *O. 13-maculata*, and with five spots on each elytron, the spots small and placed rather differently. Both specimens before me are of a very dull obscure testaceous colour in regard to the elytra, but this may be due to discoloration. *O. atroguttata* Jac., from the same locality, is a closely allied species, but it differs in the shape of the thorax, as well as in the position of the elytral basal spots and their number.

OEDIONYCHIS SUBDILATATA, sp. n.

Ovate, medially widened, black; head and antennæ piceous; thorax pale testaceous or whitish, narrowed anteriorly, impunctate; elytra broadly margined, impunctate, testaceous, an obscure transverse band at the base, with two black spots and another below the middle with another larger spot, obscure fulvous.

Length 6–7 millim.

Head impunctate, the vertex black or piceous, frontal elevations narrowly transverse, eyes rather large; antennæ piceous or dark fulvous, the third and fourth joints equal; thorax with distinctly rounded sides, gradually narrowed anteriorly, the angles rather strongly produced, the sides broadly sulcate, the surface impunctate, whitish-testaceous; scutellum black; elytra widened towards the middle, rather broadly margined, especially so at their greatest width, not perceptibly punctured, with two broad, transverse, sometimes very obscure dark bands—one at the base, containing two black spots, of which one is placed on the shoulders, the other near the scutellum, the second band below the middle, thin which a single larger subtriangular black spot is placed; der side and legs black; metatarsus of the posterior legs rather shorter than the following two joints together; claw-joint strongly swollen.

Hab. Bolivia.

The ground-colour of the elytra is but little lighter than the bands, except when these are well marked: in this case there is only the single spot visible near the scutellum—that is, in a specimen before me; in the others the black spots are well marked, but the bands are obscure.

Oedionychis atropunctata, sp. n.

Testaceous, the breast more or less black; thorax impunctate, the sides broadly flattened; elytra finely and closely punctured, each with five black spots (2.1.2).

Length 5–6 millim.

Head impunctate, with a deep triangular fovea between the eyes, the latter large, rather closely approached; frontal elevations contiguous, distinct; antennæ flavous, the 6th, 7th, and 8th joints more or less piceous, 3rd and 4th joints equal; thorax with broadly flattened sides; the lateral margins rather evenly rounded, the posterior angles produced into a small tooth, the surface impunctate; elytra with rather broadly flattened margins, finely but distinctly and closely punctured; a spot on the shoulders, one near the scutellum, a third at the middle, and two others placed transversely near the apex, black; under side (the black breast excepted) and the legs testaceous; last abdominal segment of the male rather deeply sinuate at each side.

Hab. Brazil.

The number and position of the elytral spots distinguish this species, of which I received a specimen from Mr. C. Bruch, of the La Plata Museum; two others I subsequently obtained from M. Clavareau, who likewise got them from the same gentleman, without indication of a more exact locality.

Oedionychis argentinensis, sp. n.

Black; above testaceous, the apical joints of the antennæ fuscous, the knees and the tarsi black; thorax impunctate; elytra finely punctured, somewhat flattened, each elytron with six small black spots (2.2.2) placed transversely, the last two pairs oblique.

Length 4½–5 millim.

Head entirely impunctate, broad, the eyes small and round; frontal elevations strongly raised, subquadrate; labrum piceous; antennæ long and slender, the lower four joints pale, the others piceous, third and fourth joints elongate, equal, terminal joints shorter, robust and thickened; thorax about twice as broad as long, the sides broadly flattened, posterior margin perfectly straight, the surface impunctate, testaceous; elytra finely and closely punctured—of the spots, two are placed transversely at the base, one on the shoulders, the other near the scutellum, two at the middle, with the outer one lower than the other, and two of exactly similar position near the apex; breast and abdomen, as well as the knees of all the legs and the tarsi, black; claws strongly swollen.

Hab. Buenos Ayres.

This is another of the small black-spotted species, of which I received two specimens from Mr. C. Bruch, of the La Plata Museum; the position and number of the spots and the colour of the legs separate the species from *O. atropunctata* and others.

OEDIONYCHIS NIGROPUNCTATA, sp. n.

Black, the sides of the thorax broadly testaceous, the surface impunctate; elytra extremely minutely punctured, testaceous, the sutural margins, three small spots at the base, a spot near the suture at the middle, and another below the latter, of each elytron black.

Length 7 millim.

Of posteriorly slightly widened shape; the head with a few punctures at the vertex, the latter black; the space in front of the eyes testaceous, these widely separated; frontal elevations indistinct; clypeus triangularly pointed between the antennæ; labrum obscure testaceous; antennæ extending just below the base of the elytra, black, the third joint slightly shorter than the fourth, this and the following joints robust and proportionately short, subquadrately cylindrical; thorax twice as broad as long, the lateral margins strongly rounded, the anterior angles produced forwards, the sides broadly sulcate, the disc impunctate, black, in shape of a transverse irregular band, the sides broadly testaceous; scutellum black; elytra extremely minutely and closely punctured, testaceous, with three small black spots placed on the basal margin (one at the shoulders and two at the middle) and another larger subsutural spot immediately before, as well as a smaller one below, the middle of each elytron; besides these spots, the disc is stained with irregular fuscous patches, which are specially pronounced near the suture; under side and legs black.

Hab. Bolivia.

A rather peculiarly marked species, of which I know only a single specimen. The elytral fuscous patches are probably due to discoloration.

Oedionychis torquata, sp. n.

Testaceous, the terminal joints of the antennæ and the breast piceous; head strongly punctured; thorax impunctate; elytra distinctly punctured, with three small black spots, two at the base and one at the middle of each elytron.

Length 6 millim.

Rather flattened above, the head very strongly and deeply punctured; frontal elevations transverse, strongly raised, nearly contiguous; carina short and rather broad; antennæ testaceous, the terminal joints more or less piceous, third and fourth joints equal, apical joints shorter; thorax twice as broad as long, the sides rounded and broadly flattened, anterior angles not produced outwards, the surface impunctate, obsoletely transversely grooved at each side near the base; elytra slightly widened towards the middle, very closely and distinctly punctured at the base, rather more finely so below the middle, the spots placed as in *O. humeralis* Fab., one at the shoulders, one near the scutellum, and the third of oblique shape at the middle; the breast nearly black; legs testaceous, as well as the abdomen.

Hab. Brazil.

I must separate this species from *O. humeralis* Fab., *O. 4-punctata* Schauf., and several others with nearly similar elytral markings, on account of the strongly punctured head and the black breast; the eyes are moderately large and widely separated.

Oedionychis decora, sp. n.

Narrow and subdepressed, testaceous; antennæ black, the basal and the terminal three joints pale; thorax impunctate, the anterior and posterior margins fuscous at the middle; elytra nearly impunctate, each with two basal elongate spots, a transverse band at the middle, and another spot near the apex, fuscous.

Length 5–6 millim.

Head impunctate, testaceous or pale fuscous; eyes very large; frontal tubercles trigonate, nearly joined; antennæ scarcely extending to the middle of the elytra, black, the basal joint testaceous, the terminal three joints obscure flavous, third and following joints equal; thorax flattened, rather more than twice as broad as long, the sides rounded, broadly flattened, the base (in one specimen) with an obsolete transverse groove, the disc impunctate, testaceous, the anterior and posterior margins fuscous at the middle, anterior angles acute but scarcely produced; elytra not perceptibly punctured, testaceous, with four fuscous or piceous marks—an elongate one on the humeral callus, a rounded spot near the scutellum, a short transverse band at the middle, and another larger rounded spot near the apex; under side and legs testaceous.

Hab. Amazons; also Peru.

I may add that the suture of the elytra is sometimes also narrowly marked with fuscous, and that the central band has a short and narrow stripe attached to its outer end, pointing downwards.

Elytra otherwise marked.

OEDIONYCHIS BICOLORATA, sp. n.

Testaceous; the head, antennæ, breast, and the legs black; thorax impunctate, the anterior angles produced; elytra extremely minutely punctured, the anterior two-thirds metallic greenish-æneous, the rest testaceous.

Length 7 millim.

Head with some fine punctures at the vertex, the frontal elevations pyriform; clypeus flavous, strongly transversely raised; antennæ black, the basal joint elongate, strongly widened anteriorly, third joint shorter than the fourth; thorax rather strongly narrowed anteriorly, the sides nearly straight, the anterior angles much produced and pointed, the sides broadly flattened, the surface impunctate, testaceous; scutellum black; elytra very feebly depressed below the base, very minutely and closely punctured, the anterior portion to below the middle metallic greenish, this colour not quite extending to the lateral margins and divided by a straight line from the apical testaceous portion; the breast and legs black; the abdomen testaceous.

Hab. Baños, Ecuador.

This is a peculiarly marked species, of which I know only a single specimen. The thorax has the sides less rounded than is usually the case and the angles much produced; these differences distinguish the species from *O. bolivianus* Jac., previously described, which must find its place in *Asphæra*, as the metatarsus of the hind legs is decidedly elongate; otherwise the coloration of the elytra nearly resembles that of the present species, except that the metallic colour of the latter occupies only the anterior half of the elytra.

OEDIONYCHIS NIGROBASALIS, sp. n.

Testaceous, the intermediate joints of the antennæ black; thorax impunctate; elytra very finely punctured, a transverse band at the base and another one near the apex fulvous, the extreme basal margin black.

Length 7–8 millim.

Head impunctate, testaceous or pale fulvous; eyes very large, rather closely approached; antennæ with the four basal and the two apical joints testaceous, the others black, third and fourth joints equal; thorax with very broadly flattened sides, the lateral margins rounded, the anterior angles produced outwards into a small tooth, the surface entirely impunctate, testaceous; scutellum blackish at the base; elytra testaceous, with a transverse fulvous band at the base; this band is concave at its posterior edge and extends generally downwards in a narrow stripe along the suture, where it is connected with another broad transverse band near the apex, neither of them extends to the lateral margins, and the posterior band is sometimes reduced to a round spot;

under side and legs testaceous; the extreme basal margin of the elytra black.

Hab. Rio Janeiro.

This species is principally distinguished by the narrow black base of the elytra, which extends to the shoulders and limits the fulvous band anteriorly. The colour of the antennæ will further assist in the recognition of the insect.

Oedionychis prominula, sp. n. (Plate XV. fig. 1.)

Ovately widened posteriorly, black, the apical two joints of the antennæ fulvous; thorax impunctate, narrowed anteriorly; elytra finely punctured, pale fulvous, the apical third portion black.

Length 6 millim.

Head impunctate, with the exception of a single puncture near the eyes, black; the eyes are very large and prominent; frontal elevations strongly raised, rather broad; antennæ long and slender, black, the apical two joints fulvous, third joint shorter than the fourth; thorax twice as broad as long, the lateral margins rounded, the anterior angles thickened and produced into a small tooth, the sides broadly sulcate, the sulcus connected at the base with another shallow transverse groove extending across the disc and close to the basal margin, the rest of the surface impunctate, black, very shining; scutellum black; elytra widened towards the middle, rather broadly margined, minutely and closely punctured, the anterior two-thirds flavous, the rest black; under side and legs black; metatarsus short, claw-joint strongly swollen; prosternum deeply longitudinally sulcate.

Hab. Peru.

Distinguished by the black head, thorax, and under side, and the short and posteriorly rather widened shape of the elytra.

EXPLANATION OF THE PLATES.

Plate XIV.

Fig. 1. *Homophœta angustolineata*, p. 591.
2. *H. peruviana*, p. 399.
3. *H. argus*, p. 591.
4. *Asphæra albicincta*, p. 409.
5. *A. nitidissima*, p. 415.
6. *A. elegantula*, p. 412.
Fig. 7. *Asphæra zonulata*, p. 404.
8. *A. tessellata*, p. 416.
9. *A. divisa*, p. 418.
10. *A. tarsata*, p. 402.
11. *Oedionychis duodecimnotata*, p. 451.
12. *O. regina*, p. 444.

Plate XV.

Fig. 1. *Oedionychis prominula*, p. 460.
2. *O. centromaculata*, p. 431.
3. *O. exclamationis*, p. 436.
4. *O. basinotata*, p. 453.
5. *O. semifoveolata*, p. 451.
6. *O. interrupto-vittata*, p. 436.
7. *O. arcuatofasciata*, p. 431.
Fig. 8. *Oedionychis bisbinotata*, p. 428.
9. *O. flavomarginata*, p. 451.
10. *O. ocellata*, p. 434.
11. *O. illustris*, p. 440.
12. *O. adjuncta*, p. 449.

7. Some Additions to the Knowledge of the Anatomy, principally of the Vascular System, of *Hatteria*, *Crocodilus*, and certain Lacertilia. By Frank E. Beddard, M.A., F.R.S., Prosector to the Society.

[Received June 5, 1905.]

(Text-figures 59–69.)

(1) On some Points in the Vascular System of *Hatteria*, p. 461.
(2) Notes on certain Veins in the Crocodile, p. 466.
(3) Notes on the Vascular System of *Ophisaurus*, p. 468.
(4) On the Anatomy of *Amphisbæna brasiliana*, particularly of the Vascular System and the Mesenteries, p. 479.

(1) *On some Points in the Vascular System of* Hatteria.

It is a noteworthy fact that, apart from the absence of a copulatory organ, hardly anyone has attempted to utilise the disposition of the internal viscera of *Hatteria* in order to show its primitive, or at any rate isolated, position in the series with regard to other Sauropsida. So far as I am aware, the only internal feature in which *Hatteria* has been alleged to be primitive is in the equal development of the internal surface of the lungs from end to end, there being no trace in this Sauropsidan of the partly or wholly anangious region at the caudal extremity of the lung found in Lizards *, and, of course, especially in Snakes. On the other hand, Osawa † has lately used the internal viscera to emphasise the likeness between *Hatteria* and the Lacertilia, especially even the Agamid Lacertilia. It is, in fact, agreed on all hands that the viscera of this reptile are not widely different from those of Lizards. The absence of a penis could hardly be alleged to be primitive; it would rather seem to be a specialisation.

The vascular system of this reptile does not appear to me to have been much investigated. Osawa, in his otherwise exhaustive survey of the structure of *Hatteria*, has nothing to say of the blood-vessels. Hochstetter ‡, however, has given some details concerning the intestinal arteries, quoting an earlier paper by Klaatch §. In the long bibliography given by Messrs. Howes and Swinnerton ||, which includes references to papers dealing with "soft parts," as well as with skeleton, I can find no memoir quoted which refers to the vascular system. I am able therefore, as I hope, to add something to our knowledge of this system of organs in *Hatteria*, and to furnish additional evidence towards the settlement of the much-vexed question of the place of *Hatteria* in the system.

* Milano, Zool. Jahrbücher (Abth. f. Anat.), vii. p. 545.
† Arch. f. mikr. Anat. Bd. xlix. p. 113.
‡ Morph. Jahrb. vol. xxvi. p. 217, pl. v. fig. 1.
§ *Ibid.* vol. xviii.
|| Trans. Zool. Soc. vol. xvi. p 1.

Arterial System.—The arrangement of the aortic arches is precisely like that of the Lacertilia. It is not so different from that of *Lacerta*, *Iguana*, &c. as is the arrangement found in *Varanus*. The carotid arch gives off the usual three branches before joining posteriorly the aortic arch. The third branch, that to the muscles of the shoulder, arises just before the carotid arch joins the aorta.

As to the systemic (aortic) arch (see text-fig. 59), it is interesting to note that on both sides this arch gives off an œsophageal artery; frequently, as is well known, the right arch alone gives off such a branch. Just at the meeting of the two aortæ the subclavians arise. A careful dissection shows (see text-fig. 59, *Scl.*) that both subclavians arise close to each other—and one a little in advance of the other—from the right aortic arch only just before it joins the left. Each subclavian gives off immediately after its origin a forwardly directed vertebral artery, which plunges at once into the parietes. Immediately after the junction of the two aortæ arises the first pair of intercostals. Between this pair and the next arises a gastro-œsophageal artery. This artery is separated from the gastric by three pairs of intercostals, and five pairs of intercostals lie between the gastric and the superior mesenteric artery. The intestinal arteries I need not refer to, as they have been already treated of by Hochstetter [*].

It may be mentioned that, as in some other Lizards (e. g. *Gerrhosaurus* [†]), the pulmonary arch gives off on each side a branch which runs along the windpipe and sends off branches to the thyroid.

Venous System.—There is no question that, apart from details, the venous system of *Hatteria* is distinctly Lacertilian. Nor do the differences which it shows from Lacertilia tend to prove a nearer resemblance to the Chelonia or to the Crocodilia. On the other hand, I believe it possible to detect likenesses to the Ophidia. This, however, in my opinion, does not argue a special affinity between *Hatteria* and the Ophidia, but the antiquity of the *Hatteria* type, which palæontology, as is well known, has proved.

The Lacertilia are distinguished by the double vena cava posterior, which is double, that is to say, as far forward as the gonads, from which point onwards there is but a single trunk formed by the fusion of the two trunks. As a rule, also, there is an asymmetry between the two venæ cavæ, or efferent renals, as they are commonly termed. When there is this difference, the right vessel is of greater calibre than the left. In *Hatteria* we meet with the same conditions, and here the left vena cava is of distinctly less calibre than the right. The two vessels, moreover,

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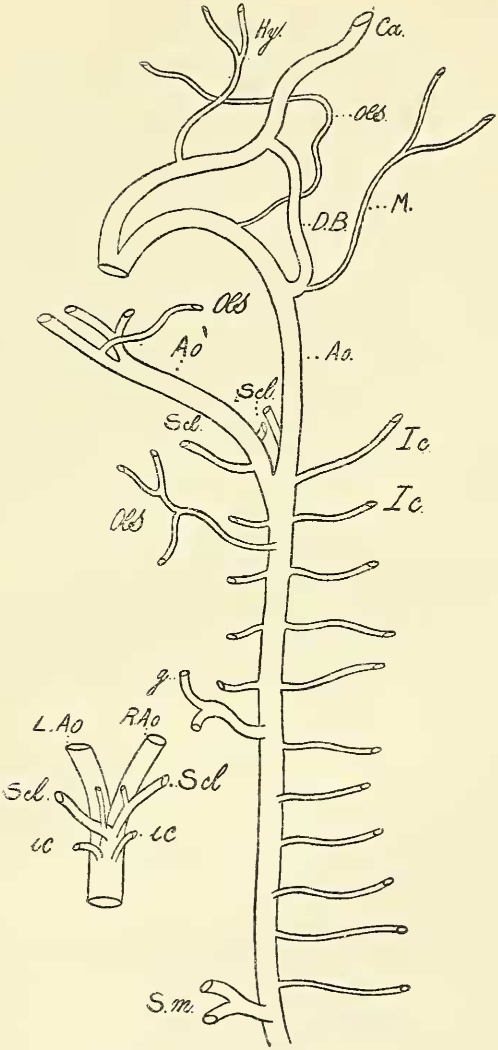
[*] Morph. Jahrb. vol. xxvi. p. 217.

[†] Beddard, "Anatomy of *Gerrhosaurus*," P. Z. S. 1905, vol. ii. p. 263, text-fig. 37, *P*.

Text-fig. 59.



Principal arteries of *Hatteria*.

The left-hand figure represents more in detail the origin of the subclavians viewed from the dorsal aspect.

Ao., *Aò.* Right and left aorta; *Ca.* Carotid; *D.B.* Ductus botalli; *g.* Gastric; *Hy.* Hyoid; *Ic.* Intercostals; *L.Ao.*, *R.Ao.* Right and left aorta; *M.* Muscular branch; *œs.* Œsophageal; *Scl.* Subclavians; *S.m.* Superior mesenteric.

as is also often the case with the Lacertilia, are separated by the dorsal mesentery.

The afferent renals are, as is the case with Lizards, derived from two sources: the caudal vein divides into the two veins of Jacobson and there is also a system of vessels derived from the hind limbs and from the parieties in that neighbourhood. I traced the veins of Jacobson for some way into the substance of the kidney. It appeared to me that they did not directly join the anterior abdominal vein; and in any case it seems clear that instead of there being a branch superficial to the kidney which joins the ischiadic afferent renal system as in other Lizards (for instance, in *Lacerta*, as figured by Hochstetter *), there is at most a branch which effects such a union running within the substance of the kidney. I am inclined even to think that the union is indirect. But in either case there is obviously an approach to the condition observable in non-Boine Snakes, where the anterior abdominal vein is independent of the caudal vein. It will be noted, moreover, that the condition observable in the kidney-region of *Hatteria* is quite remote from that to be noted in the Varanidæ and in the Crocodilia, where the ischiadic, or both the ischiadic and caudal, veins are directly continuous with the anterior abdominal vein or veins, and merely send branches to the kidney. The afferent renal system of *Hatteria* is, as it were, an exaggeration of the typical Lacertilian type.

It is more particularly the anterior abdominal vein which appears to me to show these Ophidian characters, partly matched, however, as I shall indicate later, in a legless Lizard, *Pygopus lepidopus*. In Lacertilia, at least as a rule, the conjoined anterior abdominal and portal veins enter the left lobe of the liver at or quite close to its posterior border.

In Snakes, on the other hand, there is, at least in some cases, a different arrangement. In *Eryx*, for instance †, the portal runs along the side of the liver to its anterior end, giving off branches at intervals to the liver-substance. In *Hatteria* also (see text-fig. 60) this is precisely what happens. The anterior abdominal vein, reinforced by the portal, runs in the membrane which connects the stomach with the left lobe of the liver, giving off branches at intervals to the liver-substance and receiving at intervals branches from the stomach. Towards the anterior end of the liver the conjoined porto-abdominal trunk finally disappears in the liver.

The details of the branching described here in general terms can be understood by a reference to the figure (text-fig. 60). *Pygopus* ‡ shows an intermediate state of affairs. The main branch of the conjoined portal and anterior abdominal veins enters the liver near to its posterior extremity, as in Lacertilia generally. A thin branch, however, passing forward along the

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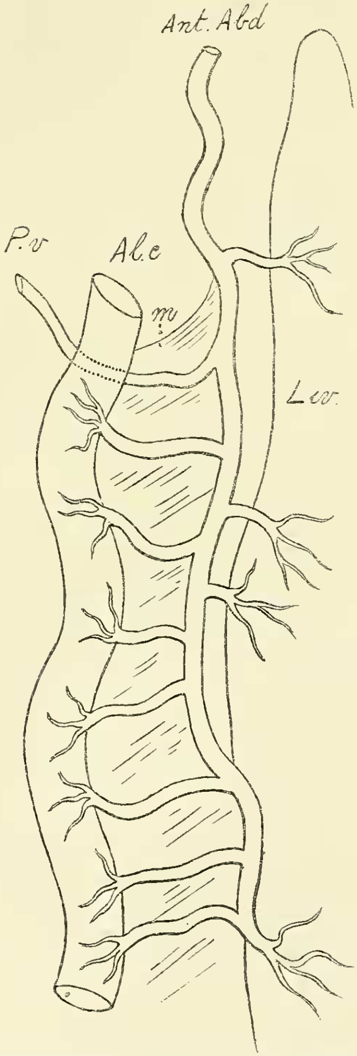
* Morph. Jahrb. vol. xix. pl. xvi. fig. 12.

† "Notes upon the Anatomy of certain Snakes of the Family Boidæ," P. Z. S. 1904, vol. ii. p. 113.

‡ P. Z. S. 1904, vol. ii. p. 17.

Text-fig. 60.



Anterior abdominal and portal veins of *Hatteria*.

Al.c. Stomach; *Ant.Abd.* Anterior abdominal; *Liv.* Liver; *m.* Gastro-hepatic ligament; *P.v.* Portal vein.

stomach, transmits branches to the anterior section of the liver.

This appears to me to be a reminiscence or a prophecy of the forwardly extended portal of *Hatteria*.

The anterior abdominal vein gives off on each side before the union of its two roots a well-developed lateral abdominal vein, so common a feature in the Lacertilia.

It is a noteworthy fact that some of the venous trunks within the liver appear upon the surface of that organ instead of being entirely concealed within its substance. Almost the whole of the vena cava is thus exposed and a considerable section of the hepatic vein.

Another difference from the conditions usually, if not always, to be observed among the Lacertilia is the total absence of dorsal parieto-hepatic veins. This might at first appear to be a point of likeness to the Crocodilia, among which the absence of these veins has been asserted.

(2) *Notes on certain Veins in the Crocodile.*

Parieto-hepatic veins in Crocodilus acutus.—As there appears to be a considerable conflict of opinion as to these veins in the Crocodilia, coupled no doubt with actual differences in different genera, it is perhaps worth while to record the condition of the parieto-hepatic veins in *Crocodilus acutus*.

Contrary to what is to be met with in many Lizards and Snakes*, this Crocodile has three sets of parieto-hepatic vessels, viz. ventral, dorsal, and lateral. The two former alone exist in the Squamata, so far as we know at present.

The dorsal parieto-hepatics exist on both sides of the vertebral column. On the left side they are most extensive and have the following arrangement:—There are five trunks which correspond to as many ribs. The three anterior of these, of which the second and third are the stoutest, combine to form a common trunk, which enters the liver (naturally the left lobe) near its posterior extremity. These vessels, where they emerge from the parietes, receive, each one of them, an intercostal. The last of these three vessels (*i. e.*, that which is most remote from the heart) gives off two branches. One of these seems to be of some morphological importance; the other appears to be less important. The latter is a branch which joins the last intercostal, which takes a share in this section of the hepatic portal system. The vessel in question runs along the "diaphragm," and, receiving the branch already referred to, enters the liver independently of the main dorsal parieto-hepatic trunk. The branch which I regard as of some little morphological importance arises from the bend of the third of the first three affluents of the dorsal parieto-hepatic; it receives an intercostal and then perforates the dorsal mesentery and joins the system of parieto-hepatic vessels of the right side. I regard this vessel as of importance because it seems to represent a corresponding vessel in *Tiliqua* *, which arises on the left side of the vertebral column and joins the right parieto-hepatic. In the Lacertilia generally the dorsal parieto-hepatic veins are on the right side only; and if there are such vessels on the left they either join the right-hand vein before entering the liver, as in *Tiliqua*, or, as in *Iguana* † and *Anguis* ‡, supply the gastric and œsophageal networks and thus reach the liver indirectly. It may be said, therefore, so far as present knowledge allows the statement, that the Crocodilia differ from the Lacertilia in having a left as well as a right dorsal parieto-hepatic, entering the liver independently into both right and left lobes.

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* In all snakes, so far as my own experience goes.

On the right-hand side of the body the single dorsal hepato-parietal trunk is composed of three stout affluents, of which the two posterior are joined by a cross anastomosis. The anterior vessel is continued forwards superficially and joins, or nearly joins, the right azygos. I may remark that on the left side the gaps between the several superficially running sections of the azygos are more pronounced.

Finally, the venous system of the liver in *Crocodilus acutus* receives another affluent, which is not, as I believe, represented in the Lacertilia. This is a vein which arises from the parietes on the right side, in a position intermediate between the dorsal and ventral parieto-hepatics. This single vein arises from a longitudinally running trunk in the parietes which corresponds, as I think, to the lateral abdominal vein; it passes straight to the liver, which it does not, however, enter independently, but in common with the dorsal parieto-hepatic.

The above-given facts are, as has been already mentioned, not in entire accord with previous statements.

Hochstetter observes § "Eine vena hepatica advehens vertebralis [=*my* right dorsal parieto-hepatic] wie bie Lacerta und anderen nicht vorkommt." But his observation refers to *Alligator lucius*. Jacquart ||, who previously studied the venous system of the same species ("Caïman à museau de Brochet"), makes no particular mention of the vessels which I describe here in *Crocodilus acutus*. He refers to what is possibly the right dorsal parieto-hepatic (figured in fig. 1, pl. iii. 20 *d*, of his memoir) merely as "une petite veine qui contourne le bord tranchant du lobe droit du foie"; and the vein in question may be really a branch of the ventral parieto-hepatic system. For the possibly corresponding vein of the left side (figured by Jacquart in fig. 1, pl. iii. 41, of his memoir) no special reference is made in the text.

Rathke ¶, however, under the name of "vena epigastrica

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* Beddard, "Contributions to the Anatomy of the Lacertilia: Pt. I.," P. Z. S. 1904, vol. i. p. 445.

† Id. *ibid.* p. 440.

‡ Morph. JB. vol. xix. p. 473.

§ Morph. JB. xix. p. 478.

|| Ann. Sci. Nat. (4) ix. 1858, p. 129 &c.

¶ 'Untersuchungen über die Entwickelung und der Körperbau der Krokodile' (Braunschweig, 1866), p. 256. The same name is also applied to the abdominal veins; but, I presume, in error for "externæ."

interna," does describe such vessels as I have dealt with above; but his descriptions do not tally exactly with the facts which I have observed, and it is not clear to what species or even to what genus his observations refer.

There are also *ventral parieto-hepatic* veins connected with the epigastric vein, which are but slightly dealt with by Rathke* and not figured by Jacquart†. These are most conspicuous in the case of the right lobe of the liver. They are partly directly connected with the right epigastric vein and partly enter the ventral parietes separately. There are three of these vessels, which arise from a slender superficial vein running along the ventral surface of the liver and continuous with the anterior abdominal vein posteriorly. The first of these ventral parieto-hepatic veins (*i. e.*, that nearest to the breast) divides into three branches, of which one joins the epigastric and the others plunge into the ventral parietes separately. The second vein is at about the middle of the liver and joins the epigastric. The third is really given off from the anterior abdominal before it enters the liver and joins the epigastric.

On the left side there is only one of these veins corresponding in position to the stronger and middle one of the three on the right side.

(3) *Notes on the Vascular System of* Ophisaurus.

The most recent memoir known to me which deals with the blood-vessels of *Ophisaurus apus* (*Pseudopus pallasii*) is by Prof. Hochstetter‡, whose notes refer entirely to the venous system of that Saurian. Some earlier works upon comparative anatomy, such as those of Siebold and Stannius §, contain various facts relating to the blood-vessels. But I find that the recorded knowledge of the course of the arteries and veins in this Lizard is practically confined to Rathke's extensive memoir|| and to Hochstetter, and does not enable us to draw up anything like a complete account of the vascular system. I have therefore thought it desirable to utilise a thoroughly injected example of this Lizard, which was treated immediately after death, for the purpose of a further contribution to the knowledge of the vascular system in Lizards, which matter has been for some time occupying my attention.

The origin of the several *aortic trunks* from the ventricle is as in other Lacertilia and a detailed description of the same is therefore unnecessary here. The *carotids* show certain peculiarities which are worth noting. The carotid artery arises from the carotid arch just where it turns over to join the systemic arch of its own side in a fashion which does not appear to

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* *Loc. cit.* † *Loc. cit.*

‡ "Venensystem der Amnioten," Morph. Jahrb. xix. 1893, p. 475.

§ Handbuch der Zootomie, 2 Theil, Amphibien (Berlin, 1856), p. 225.

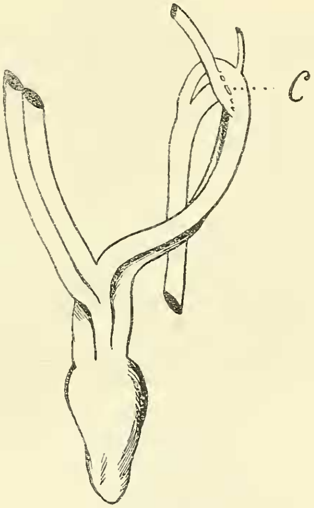
|| "Die Aortenwürzel der Saurier," Denkschr. Akad. Wien, xiii. (1857).

characterise other Lizards. As will be seen from the drawing (text-fig. 61), the artery is not merely a branch of the arch, but between the two is an abbreviated rete mirabile. The carotid, in fact, arises by three or four mouths, which at once unite to form the single vessel. This is not shown in a lateral view of the neck-arteries given by Rathke.

One cannot but compare this with the carotid "gland" of the Frog.

Precisely the same mode of origin was shown on both sides of the body, so that we have evidently not to do with an asymmetrical anomaly.

Text-fig. 61.



Heart and aortic trunks of *Ophisaurus*, to illustrate mode of origin of carotid (*c*).

Branches of Carotid.—Before the origin of the carotid artery, the carotid arch, as in other Lacertilia, gives off branches, which differ in detail from these other forms. The first to be given off is a branch to the thyroid on the right side; I did not notice a corresponding branch on the left side, and, as will be seen shortly, the right half of that gland receives its blood-supply from another source. The next trunk divides into three principal branches, of which the first supplies the sternal musculature and the adjoining parts, the next is a slender artery which runs under the skin and above the musculature, ramifying out beneath the scales. The third branch goes to the hyoid region.

The right aorta gives off the *subclavian* vessels before joining the left aorta. My observations upon these arteries agree with those of Rathke. They arise by a common stem from that aorta, which, after giving off at any rate one intercostal twig, divides into two slender trunks diverging right and left. Each of these separates from itself immediately after its own origin a vessel which rapidly plunges into the thickness of the body-wall in the middle line, and which represents on either side the anterior vertebral arteries of other Lizards. In spite of the limbless character of this *Ophisaurus*, the subclavians are still more distinctly recognisable as such than they are in *Amphisbœna*.

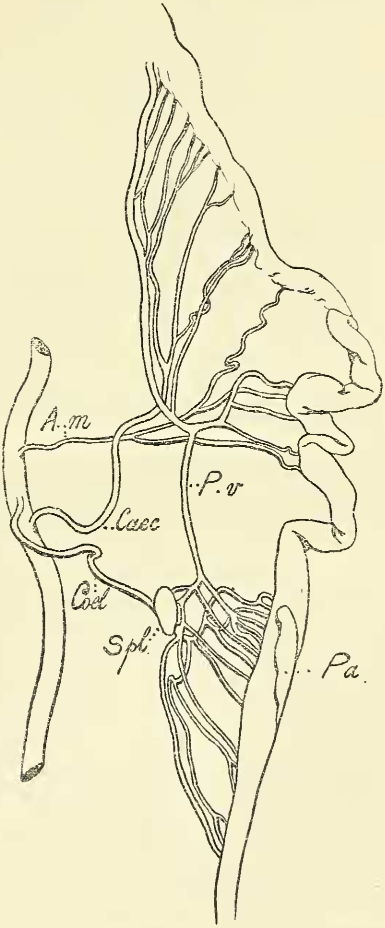
The left aorta gives off several vessels to the œsophagus before joining the right aorta, but no intercostals. On the other hand, the right aorta gives off several intercostals before joining the left. Rathke mentions œsophageal arteries as arising from the right aorta.

The carotid artery does not pass up the neck alongside of the trachea. But the windpipe is, as in other Lacertilia, accompanied by an artery. This artery, however, in *Ophisaurus* is only to be seen on the right side of the trachea; on the left there is at most a rudiment of the same. It gives off branches to the thyroid which correspond to those given off on the left side by the carotid arch before it gives off the carotid artery. This tracheal artery arises, as do the corresponding pair in *Hatteria*, &c., from the pulmonary artery. In *Ophisaurus* it is accompanied by a vein of larger calibre than itself, which runs up the neck in close contact with it and again only on the right side. On the left I could discover no traces of a corresponding vein. This vein joins the anterior cava. The asymmetry in this part of the arterial system is noteworthy, for the reason that it is the only part of the arterial system which shows, in correspondence with the snake-like habit of body, any traces of an asymmetry.

The dorsal aorta gives off ventrally a regular paired series of intercostals, which fail apparently nowhere and are even and regularly paired throughout.

Œsophageal and Gastric Arteries.—A striking feature of this Lizard as compared with many is the very large number of trunks arising from the aorta which supply the œsophagus and stomach. There are two or three œsophageal vessels arising from the left aorta before it joins the right. After the junction there are seven small arteries still supplying the œsophagus. Of these, which are not mentioned by Rathke, the first four arise from the aorta itself. After these come three trunks, which arise not from the actual aortic trunk but from the intercostal vessel of the left side. All of the œsophageal arteries are very small and at the same time very convoluted in their course. Following them are five gastric trunks, which are all of greater calibre than the œsophageal vessels. The last three of these are particularly important. A considerable gap separates these gastric vessels from the three chief arteries which end upon the walls of the intestinal canal. Hochstetter has figured three variations in point of origin of these three arteries. In the individual dissected by myself I found one of these three arrangements to exist, and that was—first the *arteria cæcalis*, second the *arteria cœliaca*, and then, of course, the mesenteric. The cœliac artery is limited to the stomach, liver, pancreas, and spleen. The small branch to the spleen arises on the right side of the mesentery. It is thus not seen exactly in the accompanying drawing (text-fig. 62), which represents the arteries and veins seen from the left aspect of the suspensory membrane of the alimentary canal. It is to be

Text-fig. 62.



Intestinal arteries and portal of *Ophisaurus,* from left side.

A.m. Mesenteric artery; *Caec.* Cæcal artery; *Coel.* Cœliac artery; *Spl.* Spleen; *Pa.* Pancreas; *P.v.* Portal vein.

noticed that all three of the important gastro-intestinal arteries in this Lizard arise from the aorta at the same plane exactly. One is not more to the right or left of the median ventral line of the aorta than the others. The hepatic artery accompanies the conjoined abdominal and portal veins in entering the liver. That organ is also supplied by several small branches (see text-fig. 64, p. 475), which naturally owe their blood to the anterior gastric arteries already mentioned, inasmuch as they accompany the gastric veins, which, as is stated below, pour their contents into the anterior region of the liver. I did not detect any further arterial blood-supply of the liver than from the two sources referred to.

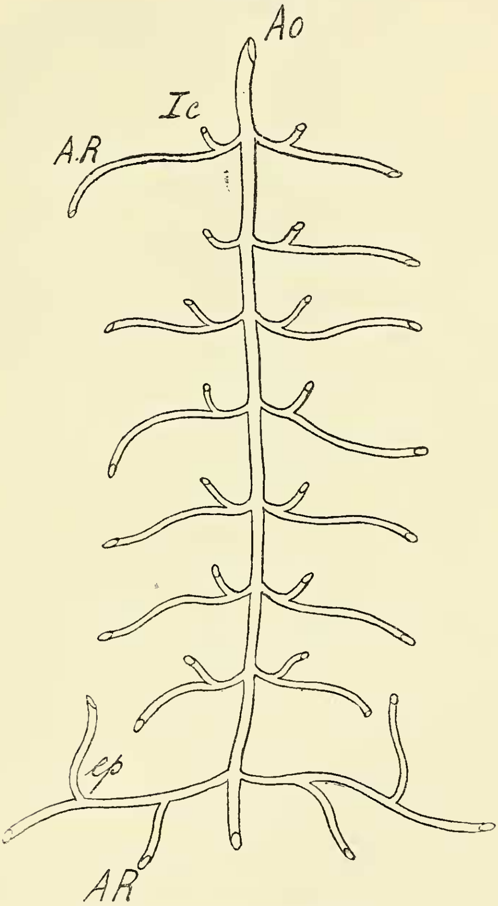
Renal Arteries.—These arteries (text-fig. 63, p. 473) are very numerous and show a great regularity, not only in their mode of origin, but in their segmental relations. I counted six separate renal arteries on the right side and seven on the left; and in addition to these the iliac trunks, which also give off the epigastric arteries, send a branch to the kidneys posteriorly. The renal arteries are accurately paired, save that one artery is missing on the right side. That they are otherwise accurately paired is connected with the fact that they all arise in common with the intercostal arteries. Each artery runs over the kidney for some distance before opening into it rather laterally and of course dorsally.

Anterior Abdominal Vein.—This vein is typically Lacertilian in origin and distribution. There are nevertheless two or three facts concerning its branches to which it will be necessary to call attention.

The vein arises as usual by two roots from the caudal vein. On each side before they unite into the single vein each half gives off two small veins side by side to the posterior part of the kidney posterior in position to the parieto-renal afferent veins mentioned below. After the origin of these a larger vein is given off which runs along the body-wall dorso-ventrally and on the outer side of the kidney. This vein dies away anteriorly before the anterior end of the kidney. It is, as I think, the lateral abdominal vein of other Lacertilia. The anterior abdominal vein runs along the mid-ventral line of the body and is supported by a fold of peritoneum, the continuation backwards of the falciform ligament, and thus the equivalent of the primitive ventral mesentery. The vein joins the portal before entering the liver close to the gall-bladder.

Hepatic Portal System.—The intestinal portal vein posteriorly frees itself from the large intestine, along which it runs in close apposition, at the junction of the small and large intestines. Henceforth it lies at some distance from the intestine in the mesentery. It is noteworthy that this main portal trunk lies on the left side of the dorsal mesentery, so that it lies superficially to the arteries when this mesentery is viewed from the left side. The vein, moreover, contrasts with the arteries over which it runs by its straight as opposed to their highly sinuous course. This applies also to the affluents of the portal, which, so far as concerns the small intestine, are five in number.

Text-fig. 63.



Renal arteries of *Ophisaurus*.

Ao. Aorta; *A.R.* First and last renal arteries; *ep.* Epigastric; *Ic.* Intercostal.

The gastric affluents of the portal trunk arise from both sides of the stomach. On the right side is a vein which runs forward along the stomach to nearly its anterior end, but stops a little before a region of the stomach the veins of which instead of joining the main portal system open independently into the liver; the arrangement of these veins will be considered presently. At the posterior end of the stomach this portal affluent joins the main portal trunk in the immediate neighbourhood of the junction of the latter with the anterior abdominal vein.

On the left side is a corresponding vein which takes up blood from the spleen as it passes that viscus.

The liver anteriorly is supplied (see text-fig. 64, p. 475) with a series of some five gastro-hepatic veins, which run across from the stomach to the liver, where they are collected into a longitudinal vein before opening directly into the liver. This forwardly directed vessel is not, however, a direct prolongation of the conjoined portal and anterior abdominal as in *Hatteria* *. This vein also receives the dorsal parieto-hepatic affluents of the hepatic portal system, which will be dealt with immediately. Accompanying each gastro-hepatic vein is an artery, which arteries I have already described above. The close association of gastro-hepatic veins and supplementary hepatic arteries is very reminiscent of what is to be found among Snakes, and very unlike the prevailing arrangement among Lacertilia. It is doubtless to be correlated with the great length of the liver in *Ophisaurus* and Snakes.

The *dorsal parieto-hepatic veins* are particularly well developed in this Lizard as compared with many other genera. And, furthermore, they differ from those of many other Lacertilia in being mainly developed upon the left instead of upon the right side. There is, in fact, only one of these veins upon the right side. On the left, on the contrary, three or four veins arise from a varied number of intercostal spaces. The most posterior of these runs along the vertebral column for a distance of seven vertebræ, receiving a branch corresponding to each intercostal space. The vertebral affluents of the hepatic portal system which arise in front of this have not so long a course along the vertebral column by far. They emerge from the parietes and at once pass downwards to the portal system. These dorsal parieto-hepatic veins join the longitudinal vein already described, which runs along the dorsal edge of the liver anteriorly and which also receives the gastro-hepatic vessels. The fact that this system is almost entirely developed on the left side is to be compared with the parallel fact that the only one of two *azygos* veins to be retained in *Ophisaurus* is also the left-hand vein.

Epigastric System of Veins.—The smaller veins which run in the umbilical (falciform) ligament and pour their contents into the liver have a somewhat different arrangement from that found in certain other Lizards. The system, instead of consisting of one continuous vein running in the falciform ligament in close apposition to the ventral body-wall in the median line with branches to the liver-substance, consists of two separate veins of considerable size. The anterior of these enters the liver far forwards. It is formed of two veins which unite just before their conjoined entry into the liver, of which the anteriorly running one is much the shorter; the posteriorly running vein extends back to nearly the end of the liver, but sends no branches into that organ; nor is it continuous, so far as I could make out,

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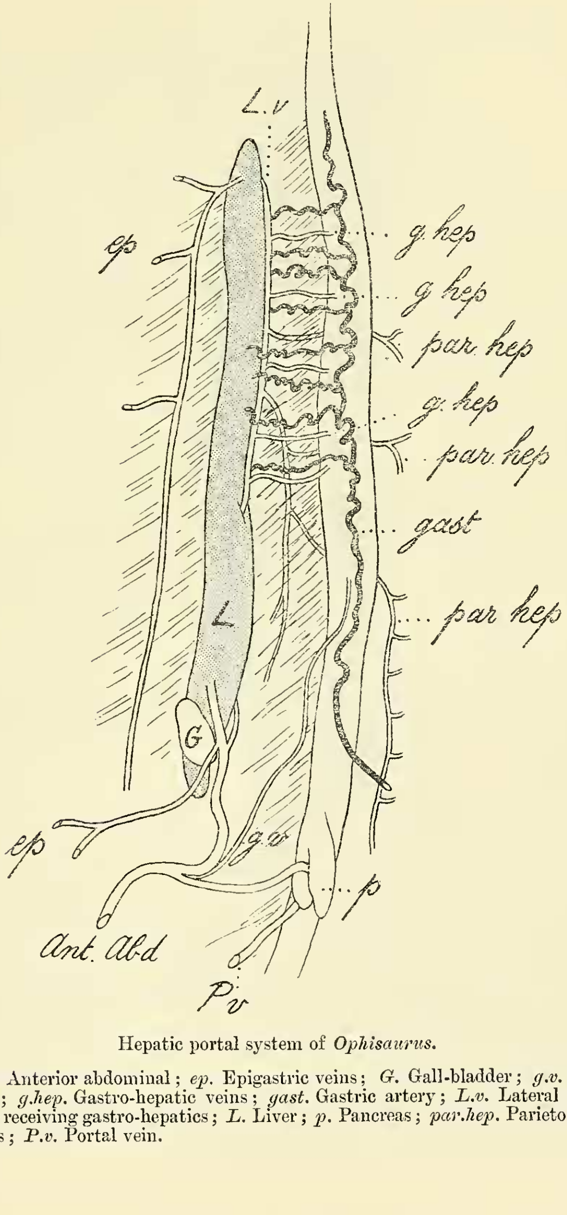
* Above, p. 464, I offer some remarks upon this extension forwards of the portal vein, also on p. 484 of the present communication.

Text-fig. 64.



Hepatic portal system of *Ophisaurus*.

Ant.Abd. Anterior abdominal; *ep.* Epigastric veins; *G.* Gall-bladder; *g.v.* Gastric vein; *g.hep.* Gastro-hepatic veins; *gast.* Gastric artery; *L.v.* Lateral vein on liver receiving gastro-hepatics; *L.* Liver; *p.* Pancreas; *par.hep.* Parieto-hepatic veins; *P.v.* Portal vein.

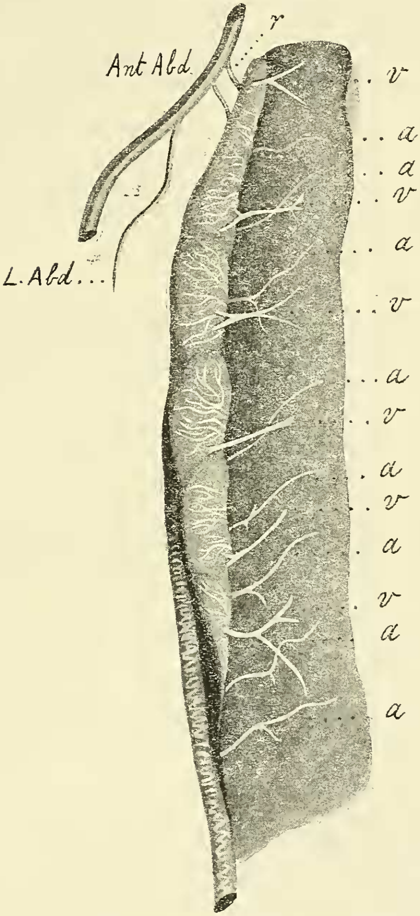
with a second epigastric vein, which, running parallel to and above the anterior abdominal, enters the shelter of the liver at its end close to the anterior abdominal and joins that vein under the lower surface of the right lobe before it loses itself in the substance of the liver. The disposition of these veins will be obvious from an inspection of text-fig. 64.

Renal Portal Veins.—In addition to the veins from the tail which bring blood to the kidneys, these glands are also supplied with blood from the parietes in their immediate neighbourhood. A series of vessels (see text-fig. 65) arises from the body-walls and plunges into the substance of the kidney on either side. These vessels were for the most part partly injected in the specimen at my disposal and can therefore be accurately mapped. The peritoneum in this region of the body as elsewhere is densely pigmented. But the difficulty of seeing through it is removed by the fact that it is very loosely attached to the parietes and to the kidneys, which lie, of course, behind it. When it is carefully removed the veins in question are very plainly exposed. They arise from the parietes very laterally—that is, not at all close to the median dorsal line, whence such vessels ordinarily arise in Lizards. Originally they appear to have been accurately segmental, one arising from each segment as denoted by a rib. In point of fact, however, the vessels belonging to two or to three ribs occasionally unite before opening into the kidney. It is also to be noted that the veins in question pour their contents into the kidney at different levels. Some vessels enter the kidney along its outer edge, while others plunge into its substance more dorsally. This arrangement is roughly alternate. There were six of these vessels to each kidney, but their distribution was not exactly the same on both sides of the body. These vessels do not appear to be referred to by Hochstetter, though he mentions them in *Anguis fragilis.* I have noticed them in other Lizards, where possibly they are represented by the veins from the hind limbs. In any case they are very conspicuous and impossible to miss in *Ophisaurus*, and their arrangement is somewhat different from that which characterises *Anguis.*

It is furthermore to be noted that those veins which enter the kidney more dorsally join in each case one of another series of afferent renals. I counted three of these on the right side, which emerge from the parietes very close to the dorsal middle line. They are rather stouter vessels, and run over the dorsal surface of the kidney nearly to the outer edge of that gland before plunging into its substance. All these parieto-renal vessels become lost in the substance of the kidney. There is no superficially running trunk continuous with the caudal vein posteriorly into which they open. Nor can they be traced into direct and superficial connection with the efferent renal veins.

Supra-renal Portal Veins.—These important veins are naturally referred to by Hochstetter, who has done so much towards the elucidation of this as of other venous systems in the Lacertilia. I shall, however, describe the conditions observed by me in a male *Ophisaurus* (Hochstetter also examined a male) as an indication of the variability of this region of the venous system. Each supra-renal body has two series of affluent supra-renals, as has *Iguana*[*]. There is an outer series springing from the lateral

Text-fig. 65.



Renal veins of *Ophisaurus*.

a. Intercostal arteries; *Ant.Abd.* Anterior abdominal vein; *L.Abd.* Lateral abdominal vein; *r*. Afferent renals; *v*. Veins running from parietes to the kidney.

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[*] Beddard, "On the Venous System in certain Lizards," P. Z. S. 1904, vol. i. p. 443.

parietes in line with the afferent renal veins that have just been described, and an inner series emerging from the body-wall close to the median dorsal line. Of the latter I observed only one vessel on each side of the body. Of the former there were two on the left side and one on the right. They collected blood, however, from more than one intercostal space. On the left side a blood-vessel belonging to the same series runs from the parietes to the sperm-duct some way behind the testis and supra-renal. I did not observe one of these vessels on the right side.

Résumé.

It may be useful to state briefly the main facts in the circulatory system of this Lizard for purposes of an easier comparison with other forms.

Arterial System.

(1) The *origin of the carotids* from the carotid arch suggests the carotid "gland" of the Frog, inasmuch as the carotid trunk arises by several mouths from the carotid arch as it bends round to join the systemic arch.

(2) As in some other Lizards, the *pulmonary artery* gives off a *branch running along the trachea* and supplying the thyroid body. This exists only on the right side. The artery is relatively small.

(3) The *subclavians* are two slender vessels arising by a common trunk from the right aorta and give off two vertebrals, one arising from each.

(4) The *intercostals* are quite *regularly paired*, and nowhere deficient or asymmetrical. They commence upon the right aorta before it joins the left.

(5) The *left aorta* gives off several *œsophageal branches*.

(6) There are *seven œsophageal arteries* arising from the common aorta, of which the last three arise from the intercostal of the left side.

(7) There are *five gastric arteries* anterior to the cœliac.

(8) The *liver* is supplied with arterial blood from *two sources*. First by the usual Lacertilian *hepatic artery*, which is a branch of the cœliac; and secondly by a number of *small trunks accompanying the gastro-hepatic vessels* and arising from the *gastric arteries*.

(9) The relative positions of the cœliac, superior mesenteric, and cæcal arteries (as has been shown by Rathke and Hochstetter) differ.

(10) The *renal arteries* are *six or seven* in number, arising *in common with the intercostals* and nearly *regularly paired*. The iliac arteries also give off a branch to the kidneys.

Venous System.

(1) The *anterior vena cava* of the right side receives a *branch*

which runs along the trachea parallel with a tracheal artery referred to. This vein does not exist on the opposite side.

(2) The *azygos vein* is developed on the *left side* of the body only.

(3) There is an unusual series of *vestiges of the posterior cardinals*, which, like the anterior vestige of the same, the azygos, are upon the left side of the body, and, with the exception of a small twig, not upon the right side. The veins form the dorsal parieto-hepatics, and *pour their contents into a common trunk which runs below the liver only in its anterior region*, and *which receives also branches from the* first half of the *stomach.*

(4) The *anterior abdominal* vein receives the portal just before its entrance into the liver, along which it is not prolonged, and just after the entrance of the portal the posterior part of the epigastric vein. The anterior region of the epigastric vein is either separate from the posterior part or joined by the minutest twig; it pours its blood into the liver near to its anterior end.

(5) There are *gastro-hepatic vessels* to the number of *four or five in the anterior region of the stomach and liver* only. The blood from the posterior region of the stomach is chiefly collected into a vessel which runs back along the stomach and joins the combined portal and anterior abdominal.

(6) The *supra-renal portal system* consists of *two series of vessels*, of which one series, consisting of one or more twigs, arises from the parietes laterally; the other series, consisting of one vessel only, arises from the parietes close to the dorsal middle line. Veins also emerge from the parietes and run to the sperm-duct.

(7) The *kidneys receive blood from* the parietes in their neighbourhood by a series of *about six veins to each kidney* arranged metamerically, and corresponding in point of emergence from the parietes with the more laterally placed supra-renal portals.

The two halves of the *anterior abdominal*, before they join, also *give off two twigs to the kidney* on each side

(8) A *lateral abdominal vein* is present, which runs along the kidney on the outer side, but dies away before reaching its anterior end.

(4) *On the Anatomy of* Amphisbæna brasiliana, *particularly of the Vascular System and the Mesenteries.*

Though a good deal of information concerning the anatomy of this genus of Lacertilia is already contained in zoological literature *, there remain certain matters which have not been exhaustively studied, either in the species (*Amphisbæna brasiliana*) with which I deal in the communication now submitted to the Society or in other species. I have therefore, in continuation of a series of dissections of the Lacertilia, some of the results of which have been published by the Society*, attempted to fill in some of the lacunæ in our knowledge of an undoubtedly interesting genus of Lacertilia, the systematic position of which within the order cannot certainly at present be regarded as conclusively decided †.

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* The principal anatomical memoirs dealing with the viscera are by v. Bedriaga (Arch. f. Naturg. 1884), Smalian (Zeitschr. wiss. Zool. 1885), and Butler (P. Z. S. 1895). In none of these is *A. brasiliana* dealt with.

Mesenteries and Veins of the Liver.—The hepatic ligaments are quite typically Lacertilian, though presenting apparent differences from those of other Lacertilia, which are due simply to the snake-like form of *Amphisbæna* and the correspondingly snake-like form of the liver. In my example of *Amphisbæna brasiliana*, measuring 15 inches in total length, the liver is 107 mm. or nearly 4½ inches. The smaller left lobe, which extends neither so far forward nor so far backward as the right lobe ‡, is only 73 mm. long. It may be noticed in passing that the liver shows several rather obliquely placed transverse fissures, a state of affairs which is known to exist in burrowing, and also in marine, snakes and in the burrowing Cæcilians. The transverse lobation of the liver is not, however, a very marked phenomenon in this Lizard and might easily be, as it has been by some at any rate §, overlooked.

The *umbilical ligament* is, as in other Lizards, attached along the whole length of the liver from beginning to end. It does not, however, end with the liver, but is prolonged further, in fact to the very end of the abdominal cavity. This fact has been noted by Butler ||, whose remarks, in so far as they bear upon the matter under consideration, are as follows:—"In many Lizards these fat-bodies, pushing the peritoneum before them, bulge into the body-cavity; and, lying on the course of the large vessel, ventral to the . . . . bladder . . . . and the alimentary canal, into the ventral ligament of which they in some forms (Amphisbænidæ) obviously extend," &c. Posteriorly, however, in the present species the umbilical ligament is not attached to the gut. It leaves the liver for the stomach at the gall-bladder and ceases to be attached to the stomach on a level with the posterior extremity of the right lobe of the liver. The ligament is single throughout.

The liver is attached dorsally by membranes which find their homologues in other Lacertilia and are indeed but little altered from the arrangements found generally. There are two of these membranes. The left-hand one attaches the left lobe of the liver to the stomach, and the right-hand membrane is the "Hohlvenegekröse" of Hochstetter, which attaches the vena cava to the dorsal parietes posteriorly and is continued on to the gonad, and which anteriorly has somewhat varying relations among the Lacertilia to the stomach and the parietes. In *Amphisbæna* this mesentery does not reach the dorsal body-wall independently

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* P. Z. S. 1904, 1905.

† For a *résumé* of opinion, see Fürbringer, "Beitrag z. Systematik und Genealogie der Reptilien," Jen. Zeitschr. xxxiv. 1900, p. 616.

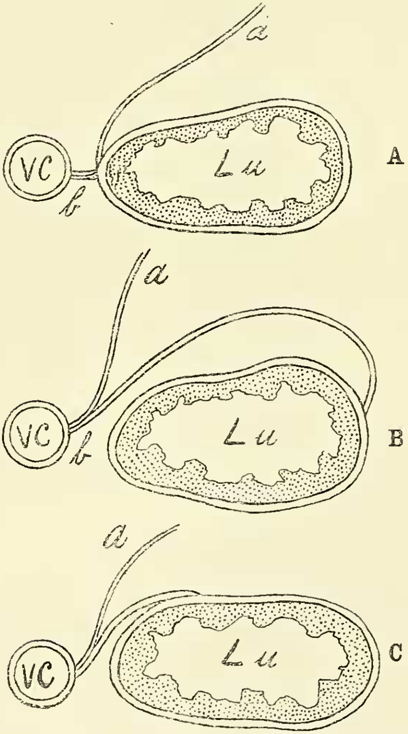
‡ It thus differs from *A. cinerea* as figured by v. Bedriaga, Arch. Naturg. p. 481 1884, pl. iv. fig. 2.

§ *E. g.* by Cuvier, 'Leçons d'Anat. Comp.' ed. 2, vol. iv. part ii. (1835).

|| "On the Relations of the Fat-Bodies of the Sauropsida," P. Z. S. 1889, p. 603.

of the stomach, to which it is attached. This disposition is possibly due to the absence of a left lung and its accompanying pulmo-hepatic ligament, which in forms where it does occur comes into relation with the right hepato-gastric ligament. At a distance of rather more than 40 mm. from the anterior end of the liver the two dorsal hepatic ligaments unite to form a single membrane, which extends forward for the remainder of the course of the liver. It is at least common, if not the rule, among the Lacertilia, for these two membranes to unite anteriorly. So that the conditions obtaining in *Amphisbæna* are merely an exaggeration of those to be seen elsewhere, and due to the elongation of the liver. I shall recur to this anatomical relationship of the membranes in considering the blood-vessels which run in them.

Text-fig. 66.



Membranes uniting vena cava and left lung in *Amphisbæna brasiliana*.

a. Umbilical ligament; *b.* Pulmo-hepatic ligament; *Lu.* Lung; *v.c.* Vena cava.

The liver is also attached to adjacent viscera by a lateral mesentery upon the left side of the body, and uniting the liver with the fully developed left lung (the only lung, as Mr. G. W. Butler has correctly asserted, which exists in *Amphisbœna*). The pulmo-hepatic ligament in question is attached to the outer border of the lung, where it is first visible (text-fig. 66, **B**) at some little distance from the commencement of the lung, but at a greater distance from the termination posteriorly of that viscus. It is seen to be covered by the umbilical ligament when the reptile is dissected so as to leave the umbilical ligament on the left side; it is furthermore attached at first to that ligament, and has therefore a common attachment with it to the liver. Further forward (text-fig. 66, **C**) the course of the attachment of the pulmo-hepatic ligament gradually moves over the lung obliquely until it comes to lie upon its inner border, *i. e.* that nearest to the liver, or rather by this time the vena cava, for the liver-substance ends anteriorly a good way behind the heart. At the same time the umbilical ligament moves obliquely in the line of its attachment in the opposite direction, so that ultimately (text-fig. 66, **A**) the inner edge of the lung is tied to the opposite edge of the vena cava by a short mesentery which is formed by the fused pulmo-hepatic and umbilical ligaments, while the inner edge of the lung is attached to the median parietes by a ligament which is presumably umbilical ligament only. These relations will be understood by an inspection of the accompanying figures (text-fig. 66), which represent a series of diagrammatic transverse sections through the region of the liver and lung which are dealt with here. These attachments between the liver and lung are not peculiar to *Amphisbœna*, as I believe; but they are specially obvious in that Lizard on account of the elongation of the organs concerned. The only other ligament in this region of the body which remains to be noticed is the pulmo-gastric, which attaches the lung to the stomach. It extends along the whole lung, and is continued beyond it as a fold upon the stomach, extending back as far as the spleen.

Amphisbœna agrees with other Lizards in the possession of a parieto-hepatic system of veins, which seem, however, to be limited to the dorsal body-wall. I could at least observe no such veins in the umbilical ligament belonging to the ventral epigastric system. Of the former there are, as Mr. G. W. Butler has correctly pointed out [*], five veins distributed along the course of the liver, and not limited, as they so often are, to the right lobe where it is free from the left. These veins (text-fig. 67) are large and for the most part bifurcate with a long course between the point of evergence from the body-wall and of entrance into the liver. They run, of course, in the right hepato-dorsal mesentery. The large number of these veins is not an important character, for in *Scincus officinalis* I find as many as six. It is their extension along the whole length of the liver which is worthy of note, and is a likeness to the conditions which obtain in the Ophidia.

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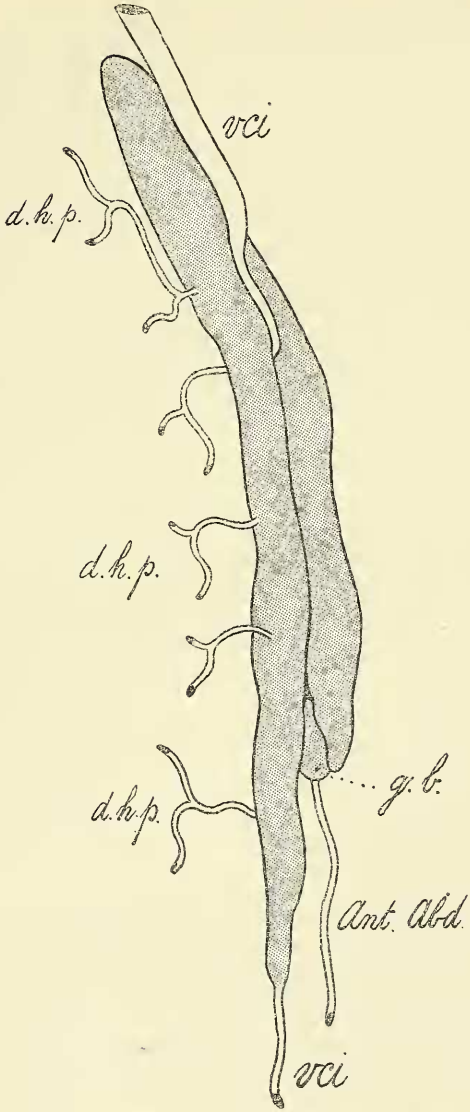
[*] P. Z. S. 1895, p. 699, footnote.

Text-fig. 67.



Liver of *Amphisbæna brasiliana*, ventral view.

Ant.Abd. Anterior abdominal vein; *d.h.p.* Dorsal parieto-hepatic vein; *g.b.* Gall-bladder; *vci.* Vena cava posterior.

Between the liver and the stomach runs a forward extension of the portal vein, which dies away anteriorly but nearly reaches the forward extremity of the liver. At first the dorsal parieto-hepatic vessels, where the right lobe of the liver is prolonged beyond the gall-bladder, open directly into the intra-hepatic venous system. But further forward, where the two lobes of the liver come into continuity and the two dorsal hepatic ligaments fuse, the parieto-hepatic portal veins open into (or at least very close to) the forward extension of the portal vein already referred to. It is only in this region that gastro-hepatic vessels occur. The left gastro-hepatic ligament carries no gastro-hepatic vessels, that I could see, in that part where it is free from the right ligament. The vessels, in fact, are first visible about 40 mm. from the anterior end of the liver. They open into the longitudinal portal vessel like the dorsal parieto-hepatic veins.

It is important to notice the likeness which the arrangement of these veins in *Amphisbæna* bears to the similar arrangement of the same veins in Snakes on the one hand and in *Hatteria* on the other. In Lacertilia, as a rule, the gastro-hepatic veins bringing blood from the stomach and œsophagus to the liver enter the latter organ separately, or at most one or two blend together before opening into the blood-sinuses of the liver. In *Hatteria*, as I have already pointed out*, there is a collecting-vein, which is a prolongation forward of the portal vein, that is the conjoined portal and anterior abdominal, which runs in the gastro-hepatic ligament on the left side of the body and receives on the one hand veins from the stomach, while on the other side it gives off veins to the liver. There is, however, in *Hatteria*, no further resemblance to the conditions which obtain in *Amphisbæna*. In Snakes there is the further likeness in that, while there is the same forward prolongation of the portal vein forwards between the liver and the stomach, this vein not only receives branches from the stomach which it transmits to the liver from the opposite side, but it is also in connection with the venous system of the body-wall by means of the dorsal parieto-hepatic veins, which thus come, as in *Amphisbæna*, into close relations with the gastro-hepatic veins.

The important point of likeness between all three types is, as it appears to me, the extension forwards of the portal up to or nearly up to the anterior extremity of the liver. The close association in Snakes and in *Amphisbæna* of the dorsal parieto-hepatic vessels with branches from the stomach to the liver seems to me to be dependent merely upon the narrow form of the body and of the liver, and the consequent necessity of packing everything in a narrow space. As it is so markedly the rule for the portal to enter the liver at its hinder border in the Lacertilia, these two divergences from that normal condition cannot but attract attention, especially as they show a likeness to the admittedly nearly related Ophidia. A likeness between *Hatteria* and the Ophidia fits in well with the view that *Hatteria*, though unquestionably an ancient form, is nevertheless to be placed closer to the Squamata than to any other group of Reptiles. The Amphisbænids undoubtedly differ much from other Lacertilia, not only in structures related to their apodous condition and snake-like habit, but in various features which have at least no obvious connection with their mode of life. There are no clear indications of their relationship to other Lacertilia [*]. It may be that the fact dealt with above is of some suggestiveness as a clue to the position of this group, which, judging from its distribution and great modification, would not seem to be a modern type of Lacertilian.

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* Above, p. 464.

Other Veins.—It has been recorded by v. Bedriaga that the *posterior vena cava* of *Amphisbæna* shows no divergences from the Lacertilian type. The left vena renalis revehens turns abruptly to the right at about the middle of the testis, where it receives the left spermatic vein, and from the right vena renalis revehens where the latter receives the right spermatic vein. In its course the vena renalis revehens of the right side (no doubt of the left also, though I have not positively ascertained the fact) appears to receive several veins from the parietes. These, however, really open into a vein to be described later.

Supra-renal portal veins exist. There were two on the left side and two on the right. On the right side, where circumstances allowed a more careful study, these veins were seen to open into a vein running along the vas deferens as figured by Hochstetter [†] for *Lacerta viridis*. But in *Amphisbæna* this vein runs back to the kidney and receives in its course between the testis and the kidney four veins from the parietes springing close to the dorsal line. In continuation of this series three veins open into each kidney.

This vein is shown in the accompanying figure (text-fig. 68, p. 486). It is clearly the equivalent of the *vena deferentialis* figured and described by Hochstetter in *Varanus* [‡]. He does not, however, mention branches to it from the parietes, such as occur in *Amphisbæna*. Considering this latter fact and the relations of the vein to the vas deferens (Wolffian duct), I imagine that it is to be regarded as a persistent, though small, posterior cardinal vein.

V. Bedriaga, in his illustration [§] of the viscera and vascular canals in *Amphisbæna cinerea*, shows veins from the parietes opening into the vena renalis revehens of the left side. But this illustration refers to a female example, in which the vein which I have just described may not exist. Moreover, veins running along the oviducal membrane and opening into the kidney-system, such as exist in other Lizards, are obviously not the homologues of this *vena deferentialis*, or posterior cardinal as I prefer to call it.

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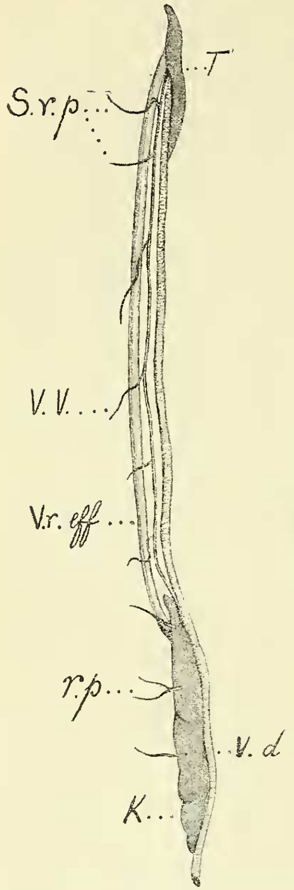
[*] They are, as it appears to me, rightly regarded by Fürbringer as a suborder equivalent to Lacertilia vera, Chamæleonta, &c.

[†] Morph. JB. xix. Taf. xvi. fig. 13.

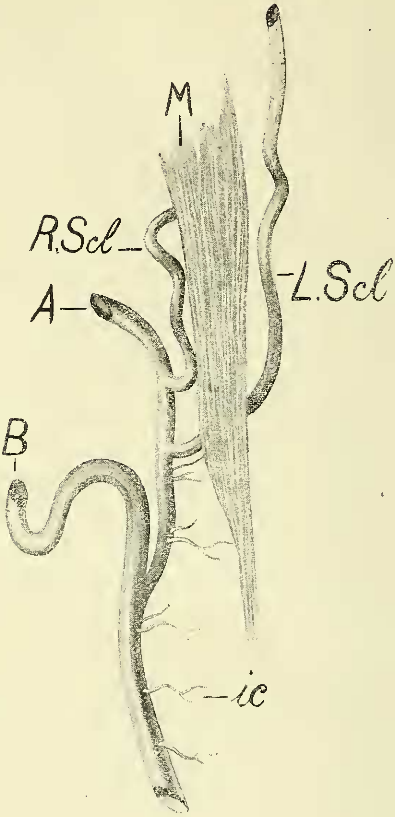
[‡] *Loc. cit.* p. 465, Taf. xvi. fig. 17, *v.d.*

[§] Arch. f. Naturg. Bd. l. 1884, pl. iv. fig. 2, *rr.*

Text-fig. 68.



Text-fig. 69.



Text-fig. 68.—Kidney, testis, and intervening veins of *Amphisbæna brasiliana*.

K. Kidney; *r.p.* Veins from the parietes to the kidney; *S.r.p.* Suprarenal portals opening into a cardinal; *T.* Testis; *V.d.* Vas deferens; *V.r.eff.* Renal efferent vein; *V.V.* Parietal veins opening into cardinal.

Text-fig. 69.—Origin of subclavian in *Amphisbæna brasiliana*.

A & *B.* Aortic arches; *ic.* Intercostals; *L.Scl.* & *R.Scl.* Left and right subclavian *M.* Muscle referred to in text.

Arterial System *.—As is well known, the carotids in *Amphis-*

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* The arteries of *Amphisbæna* (but not of the present species) are dealt with by Rathke, v. Bedriaga, and Smalian (Zeitschr. wiss. Zool. 1885), the last of whom does not give many details.

bæna are not joined by ductus Botalli to the systemic arch. The left systemic arch in *A. brasiliana* is considerably larger than the right.

The left anterior vertebral artery is not exposed for the whole of its course within the body-cavity. Shortly after its origin from the right aortic arch, and while its course is still oblique and towards the left side of the body, it is covered by a muscular layer, which is a continuation of the thick muscle covering the vertebral centra in the cervical region, and forming a soft cushion for the œsophagus to rest upon, and corresponding, I presume, to the longus colli. This muscle (see text-fig. 69, p. 486), after crossing the left anterior vertebral artery as already mentioned, becomes more and more slender and disappears. It is important to note that it is not symmetrical, and that no corresponding slip covers the right anterior vertebral artery. This curvature of one artery at least by a muscular slip seems to me to have a bearing upon the homology of the arteries.

The origin of these arteries from the right aortic arch, and the fact that one springs from the aortic stem in front of the other, is a distinct point of likeness to the subclavians of other Lizards, which give off an anteriorly running vertebral. The loss of the fore limbs and the increased importance of the neck for burrowing purposes might account for the disappearance of the main subclavian stem and the increase of its vertebral branch. The burrowing of the artery in question beneath the musculature to which I have referred is found in the case of the subclavian of *Tiliqua*[*].

There are three very slender *œsophageal arteries* arising from the aorta. They are followed by three gastric arteries, of which the last lies a little way behind the gall-bladder. The mesenteric arteries have been shown by Rathke[†] to differ considerably among the Amphisbænidæ. In the species examined by me there is a cœliac artery followed by a common mesenteric; the intestine is also supplied by a posterior mesenteric which arises from the aorta among the renal arteries.

The *spermatic arteries* arise just after the arteria mesenterica communis; the right is slightly in advance of the left. They both arise in common with an intercostal. On the left side an additional spermatic artery arises very close behind the main one.

Behind the spermatic arteries a number of fine arteries supply the vas deferens. Of these I counted six on the left side, and there are about as many on the right. As a rule (five on the left side), these arteries arose directly from the aorta and independently of the intercostal arteries.

The *renal arteries* differ in number on the two sides of the body. I counted four on the left and five on the right side.

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[*] Beddard, P. Z. S. 1904, i. p. 465.

[†] Abh. Ak. Wiss. München, ix. (1863). See also Hochstetter, Morph. Jahrb. xxvi. (1898).

They very largely arise in common with intercostals. They do not, however, show the continuous symmetry and regularity that is shown by the renal arteries in *Ophisaurus*. In *Amphisbæna cinerea*, v. Bedriaga states the presence of 5–7 pairs of renal arteries, of which the first pair are much the largest and are traceable for a long distance along the outer border of each kidney.

The *intercostal arteries* in *Amphisbæna* are upon the Lacertilian plan, and not upon that shown in the Ophidia in spite of the length of the body. They are paired equisized arteries[*], each artery of a pair close together in their origin from the ventral surface of the dorsal aorta. Though these pairs are regular and repeated with no variation from segment to segment, there are nevertheless occasional, but very occasional, indications of a divergence in the direction of the arrangement so characteristic of the Ophidia other than the Boidæ. In one case, on the left side of the body, a single intercostal artery bifurcated immediately after its origin from the aorta and supplied two intercostal regions, one in front and one behind. In another case an intercostal was wanting on the left side, but a branch from the right corresponding intercostal was seen to pass under the vertebra and to supply the left side of the body. Very generally the intercostals branch before becoming lost to sight within the muscles of the dorsal parietes. There are two divisions which burrow, and a trunk which runs superficially outwards between the ribs. This superficial trunk is to be seen in other Lacertilia, particularly among the Scincidæ. No intercostals arise from the left aortic arch, which is, indeed, free from branches of any kind. Three pairs arise from the right aortic arch.

Lungs.—The trachea and lungs of the present species differ very considerably from those of *Amphisbæna fuliginosa*, described and figured by Wiedersheim[†]. That author figures the lung as extending considerably anteriorly to the heart, and the trachea opens into it by a series of short branches of its lower surface. The arrangement, in fact, is obviously suggestive of the "tracheal lung" of certain Snakes, and especially of the genus *Ophiophagus*, where, as I myself have recently described, the trachea opens by a series of orifices into the pre-cardiac portion of the lung[‡]. An almost exactly similar specialisation in a Snake, or rather in many Snakes and in a snake-like Lizard, is very remarkable. It seems possible, in view of the fact that the tracheal lung exists in Snakes of quite different families, and that it also exists in *Amphisbæna fuliginosa*[§], that this state of affairs is primitive and is to be referred to an Amphibian ancestor in which the lung, as in the Frog &c., opens at once into the pharynx without the intermediation of any length of trachea.

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[*] V. Bedriaga, however, figures the first few intercostals as arising in an irregular and therefore snake-like fashion.

[†] Vergl. Anat. Wirbelth. 2nd ed. 1886, p. 558.

[‡] P. Z. S. 1903, vol. ii. p. 322.

[§] Smalian, however (Zeitschr. wiss. Zool. 1885), does not find this arrangement.

In any case the tracheal lung does not exist in *Amphisbæna brasiliana*. The trachea opens into the lung some way behind the heart, and is only continued into the lung for a very short way. The short portion of the trachea which lies within the lung shows an irregularity in the cartilaginous rings, which are no longer uniform hoops. The rudimentary right lung is exactly half an inch long, and, like the long left lung, extends for a short way in front of the entrance of the trachea. The left lung reaches down the body as far as the end of the liver. Of the lung of *Amphisbæna* (presumably the species *fuliginosa*) Dr. Wiedersheim writes in the same work (referred to in footnote): "Die Lunge, deren interessantes Verhalten zur Trachea ich früher schon erwähnt habe, ist insofern höher entwickelt als diejenige der Lacertilier, als es kein einheitliches centrales Lumen mehr besitzt, sondern von einem feinen Bälkchennetz durchflochten ist." The lung, in fact, of that species would appear to resemble that of higher Reptiles, such as the Crocodilia. In *Amphisbæna brasiliana* there is nothing of the kind to be seen. The lung is a simple sac as in Lizards generally. It has not, indeed, even traces of a more complex structure, such as are to be found in many Lacertilia. The walls show the usual honeycomb appearance, and they are fairly thick, which would seem to allow of a considerable inflation of the lung. These important differences between two species placed in the same genus would seem to suggest that the genera of Amphisbænidæ need revision. They are remarkably analogous, as I have observed, to the differences which distinguish the Hamadryad Snake from the Cobra; and these two are by many authorities confounded in one genus *.

December 12, 1905.

HOWARD SAUNDERS, Esq., Vice-President, in the Chair.

The Secretary read the following report on the additions that had been made to the Society's Menagerie in November 1905:—

The number of registered additions to the Society's Menagerie during the month of November was 147, of which 64 were by presentation, 24 by birth, 9 by purchase, 35 were received on deposit and 15 in exchange. The number of departures during the same period, by death and removals, was 166.

Amongst the additions attention may be called to:—

An Abyssinian Guereza (*Colobus abyssinicus matschiei*) and a White-tailed Mongoose (*Herpestes albicauda*) from the Upper Nile, presented by Mr. J. J. Harrison, on Nov. 3rd.

A Water-Chevrotain (*Dorcatherium aquaticum*) from Liberia, presented by Sir Harry Johnston, G.C.M.G., K.C.B., on Nov. 25th.

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* See Beddard, "On the Trachea &c. of the Hamadryad," P. Z. S. 1903, vol. ii. p. 319.

A Capybara (*Hydrochœrus capybara*), a Violet-eared Humming-bird (*Petasophora iolata*), two Purple Sugar-birds (*Cœreba cœrulea*), two Spotted Emerald Tanagers (*Calliste guttata*), and a Red-billed Toucan (*Rhamphastos erythrorhynchus*), from Carácas, Venezuela, presented by Capt. Albert Pam, F.Z.S., on Nov. 25th.

The Secretary exhibited a coloured print, published by R. Ackermann in July 1812, of Polito's Royal Menagerie at Exeter 'Change, London. Mr. Polito died in 1814, and the Menagerie was taken over by his chief assistant Mr. Cross, a relative of the well-known Liverpool naturalist. The Exeter 'Change Menagerie became famous in 1827, because of the death of an Elephant which became infuriated and had to be killed. The Secretary was indebted to Mr. Howard Saunders, V.P.Z.S., for calling his attention to a long account of this occurrence published in Hone's 'Every-Day Book' for 1827.

Mr. A. H. Cocks, F.Z.S., exhibited twelve enlarged photographs of Whales taken by him at the Finwhaling Factories in East Finmarken in 1883–89. The species represented were *Megaptera longimana*, *Balænoptera sibbaldii*, *B. musculus*, and *B. borealis.*

Mr. Geo. P. Mudge, F.Z.S., exhibited an abnormal Dogfish (*Scyllium canicula*) in which the proximal limb of the siphonal stomach was everted into the pharynx, where it took the form of a flattened spathulate-shaped sac. Within the sac (which was lined with cœlomic epithelium) there were contained the distal loop of the stomach, the spleen and pancreas. That it was a permanent condition, formed in the course of development, he believed to be shown by the great length of the lieno-gastric artery and by the presence of a peculiar triangular-shaped invaginated sac, supplied by this artery, and infolded from the dorsal surface of the everted loop of the stomach at its anterior end.

Mr. Mudge also exhibited an Earthworm (*Allolobophora* sp.?) with a bifid posterior extremity. It was found at Bradfield, Manningtree, in Essex, and was sent to Mr. Cole, the honorary curator of the Essex Field-Club Museum, who was kind enough to lend it to Mr. Mudge for description. The worm was normal to about the 56th segment, or to rather more than one-half its length, when it divided into two nearly symmetrical branches; the right branch at its origin was just a trifle larger than the left, but otherwise the two were equal.

A distinct anal aperture was present at the posterior extremity of each branch, and indicated that the intestine was branched in a corresponding way. The dorsal (supra-intestinal) blood-vessel could be distinctly seen through the body-wall, and it branched in the same fashion as the body. Each branch bore its own four rows of setæ.

Mr. H. B. Fantham, B.Sc., F.Z.S., exhibited and made the following remarks upon microscopic preparations of a new Hæmosporidian parasite belonging to the genus *Piroplasma*, from the blood of the white rat:—The parasite is endoglobular and the trophozoites are ovoid (0·5 to 1·5 μ in diameter) or pear-shaped (2 to 3 μ long and 1 to 1·5 μ broad), and usually uninucleate. A single pear-shaped trophozoite often occurs alone in a blood-corpuscle of the host. Some amœboid forms were seen in the spleen. Schizogony takes place inside the red blood-corpuscles by simple fission. Double infection of a blood-corpuscle may occur, while free ovoid forms of the parasite have also been seen. For this new species of *Piroplasma* in the white rat, the name *Piroplasma muris* is proposed. The parasites are not numerous in the peripheral circulation of the host, but occur in greater numbers in the spleen, liver, and bone-marrow.

Some of the pathological effects (piroplasmosis) in the white rat, due to this parasite, were anæmia, biliary fever, alopecia, emaciation, ulcers on the ears and tail, enlarged spleen, &c., and proved fatal.

The genus *Piroplasma* is of great interest, as species of it give rise in various mammals to serious diseases, usually of the nature of biliary fever. *P. bigeminum* is the pathogenic agent of Texas Fever (Redwater) in cattle; *P. canis* of malignant jaundice in dogs; *P. equi* of biliary fever in horses; and *P. ovis* of similar diseases in sheep. Piroplasmosis may also occur in the human subject, e. g. *P. hominis* is found in the blood of persons suffering from Spotted or Tick Fever in the Rocky Mountains; while the Leishman-Donovan bodies found in cases of "Kala-azar" and Delhi boil in India are referred by Laveran and Mesnil to this genus, as *P. donovani*. A *Piroplasma* has also been stated to have been found in the blood of certain lizards in India, though details have not yet been published. The symptoms in the white rat seem to exhibit a combination of those enumerated in other mammalian hosts.

Piroplasmosis is usually disseminated by ticks; but no ticks have yet been found on infected white rats. Perhaps the intermediate host in this case is a louse or a flea. No flagellates were found in citrate cultures of the blood of infected white rats, though Capt. Rogers, I.M.S., has obtained flagellates from cultures of *P. donovani*.

Mr. Oldfield Thomas, F.R.S., F.Z.S., exhibited the tail-vertebræ of a Dormouse of the genus *Eliomys* recently received by the British Museum from Central Asia, and stated that it appearie to represent a case of regeneration similar to what occurred in the tails of Lizards. Any form of regeneration of osseous parts had been hitherto quite unknown among Mammals*.

The external tail of this Dormouse was about 5 cm. in length, and was thickened, fat, and club-shaped terminally, where its hairs, 9 or 10 mm. long on its basal portion, lengthened to 25–28 mm. It formed therefore a sort of bushy club, quite different to the simple distichous tail of a normal specimen. A similar tail had been described in a Liberian Dormouse (*Claviglis crassicaudatus* Jent.†), but the bones had not been examined.

On extracting the bones of the tail, they proved to be of an appearance so closely similar to that found in cases of regeneration in Lizards, that Mr. Thomas had no doubt whatever that they were of the same nature, and search for further examples fully confirmed this opinion.

For, firstly, among the collections of the British Museum there was found an example of a small *Graphiurus* from Fernando Po with a similar club-shaped, bushy tail, always hitherto looked upon as accidentally broken, and this on being opened proved also to contain a long regenerated terminal "style," as shown in fig. 71.

But this specimen, like that from Central Asia, was open to the objection that being a single individual from an out of the way locality, it might conceivably represent a normal specific variation, and not a case of regeneration.

Happily, however, further search had resulted in the discovery of four specimens of a species of *Graphiurus* from the Cameroons, sent by Mr. G. L. Bates, one of which had a club-shaped tail, with a styliform bony appendix, while the other three had normal Dormouse tails. This series thus put beyond cavil the inference already arrived at as to the abnormal character of the specimen exhibited.

Text-fig. 70 shows the tail-vertebræ and regenerated appendix of the Central-Asian Eliomys, now exhibited. The caudal column consisted of 11 normal vertebræ, while the proximal end of the 12th was also normal. But distally this vertebra thinned out into a long slender style, its total length being 15 mm. and its diameter (after the basal 2 mm.) rather less than 1 mm. At its tip there was a constriction succeeded by a small thickened knob. The preceding vertebra measured 6·2 × 1·8.

Text-fig. 71 shows the tail of the Fernando Po *Graphiurus*. Here, owing to the original breaking having occurred nearer the body, there appeared to be only about six normal vertebræ preceding the elongated terminal one. This latter was 11 mm. in length, and instead of the knob at the end it had a slightly crooked point. The drawing would show the position of the point relative to the general body of the tail.

On breaking the terminal spike across, its section proved to be similar to that in Lizards, there being a central tube filled with soft or cartilaginous matter, and surrounded by a cylindrical bony envelope, of similar appearance and texture to the true caudal vertebræ. A proper microscopic examination and report would, it was hoped, be made by Dr. Ridewood.

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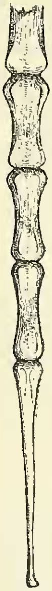
* "In the Mammals neither the legs nor the tail nor the jaws regenerate, although several of the internal organs . . . . have extensive powers of regeneration."—Morgan, T. H., 'Regeneration,' p. 97 (1903).

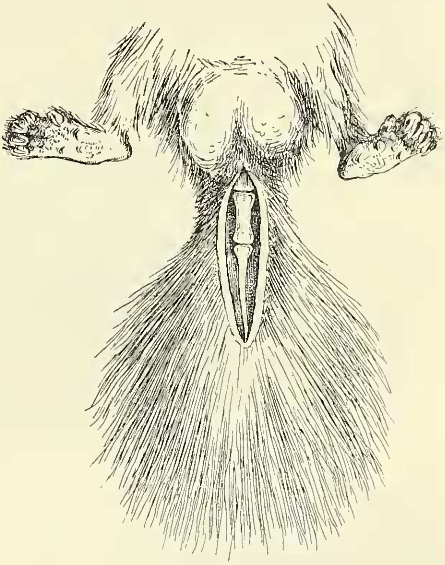
† Notes Leyd. Mus. x. p. 41 (1887).

In the third specimen from the French Congo the tail had been broken at about a third of its length, and the regenerated terminal vertebra, with its spike, measured 15 mm. in length.

Text-fig. 70.



Text-fig. 71.



Text-fig. 70.—Tail-vertebræ and regenerated appendix of a species of Central Asian *Eliomys.*

Text-fig. 71.—Tail of a species of *Graphiurus* from Fernando Po showing regenerated appendix.

It seemed clear from these specimens, from the type of *Claviglis crassicaudatus*, as described by Dr. Jentink, and from the appearance presented by certain other skins of *Graphiurus* in the Museum Collection, that in the not uncommon event of losing part of their tail, Dormice—perhaps of all species—were able to supply the place of the lost part by swelling up what remained into a club-shaped organ, clothed externally with abnormally long hairs, and supported internally by an elongated rod of bone growing out of the vertebra in which the break had occurred.

Such a regeneration would be of essential value to the animal, for, in climbing, the tail was used as a balancer, and, if broken off short, its balancing functions might be restored by the increase in its thickness and length.

Dr. W. G. Ridewood, F.Z.S., exhibited microscopic sections of the skeletal tube found in the restored tail of one of the Dormice (*Graphiurus*) exhibited by Mr. Thomas. He showed that the wall was made up of close-set lamellæ, producing in a transverse section a fine concentric striation. Lacunæ with numerous branching canaliculi were disposed regularly in relation with the concentric striations, and the general effect was that presented by a transverse section of the humerus or femur of a Frog. Internally to the bony layers and contiguous with the central jelly was a moderately thick layer, which was clear, homogeneous, and highly refractive.

Dr. Ridewood also exhibited, by way of contrast, slides of the skeleton of the restored tail of an Iguana Lizard, the skeletal tube in this case being composed of calcified fibro-cartilage and not of bone.

The following papers were read:—

1. On the Habits and Reactions of Crabs bearing Actinians in their Claws. By J. E. Duerden, Ph.D., A.R.C.Sc. (Lond.), Professor of Zoology, Rhodes University College, Grahamstown, Cape Colony[*].

[Received November 29, 1905.]

(Text-figures 72–76.)

Prof. K. Möbius, in 1880 ('Beiträge zur Meeresfauna der Insel Mauritius und der Seychelles'), described the crab *Melia tessellata* (Latr.) as having the remarkable habit of holding a living actinian in each claw[†]. The polyps are carried about in front of the crab, held in a kind of defensive attitude, and it is assumed that the actinians, by means of their stinging-threads, may be of service to the crab as aggressive and protective agents and assist it in securing its food; while, on the other hand, the movements of the crab may serve the actinians by bringing them into the neighbourhood of more prey.

The fact of one animal making direct use of an altogether different type of animal whereby to obtain its food, employing it as if it were a weapon or implement, would appear to be unique among the lower animals, and involves questions as to the mutual relationships of the two, the reactions of one towards the other, the manner in which the combination is brought about, and the peculiarities which each may exhibit in correlation with the commensal habit.

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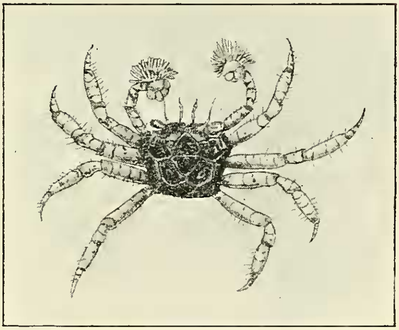
[*] Communicated by Prof. Hickson, F.R.S., F.Z.S.

[†] The account is given in a footnote (p. 174) to Dr. F. Richter's Report of the Crustacea of the Mauritius and the Seychelles Islands, the crab with an actinian in each claw being depicted on plate xvi. fig. 19.

The note by Möbius is as follows:—"I have collected about 50 male and female examples of *Melia tessellata*, all holding in each claw an *Actinia prehensa* [text-fig. 72]. The hooks on the inner border of claws are bent in a peculiar manner, so as to hold fast the actinian. I have never been able to withdraw the actinian from the crab without injury. If the pieces of the actinian which had been thus withdrawn were allowed to remain in the vessel along with the *Melia tessellata*, the latter again seized them in a short time. If the actinians were cut into pieces they were again found in a few hours in the claws of the crabs.

Text-fig. 72.

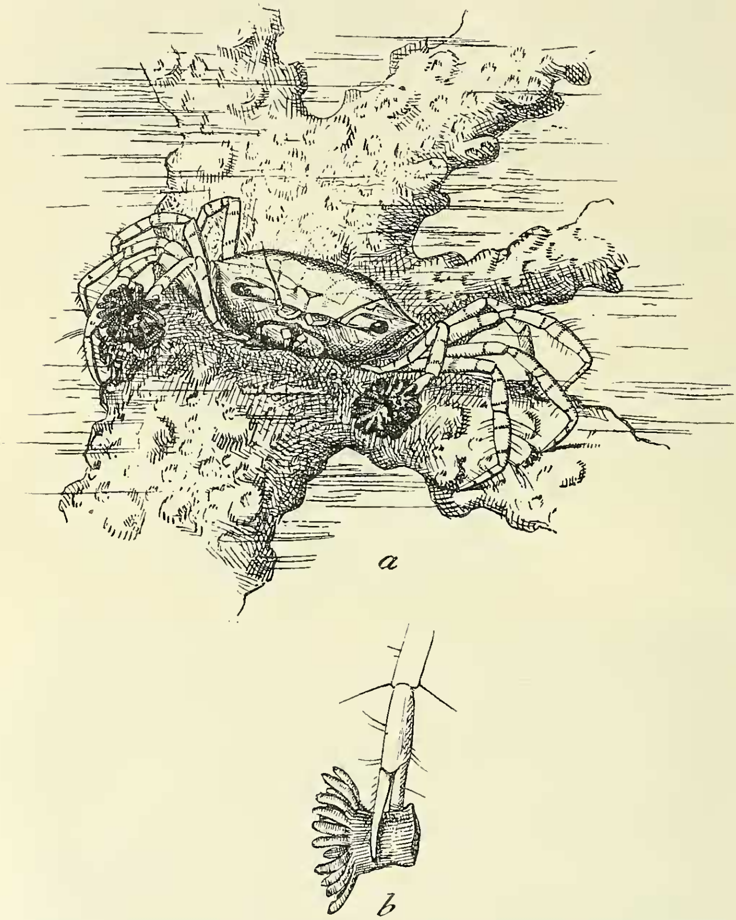


Melia tessellata from Mauritius, holding an actinian in each claw (Richter).

"It is very evident that the actinians by means of the threads of their stinging-cells are able to assist the crab in securing its prey, for which the actinian has the advantage of being carried from one place to another, and by this means is brought into touch with more animals which serve them as food. We have here a very interesting case of commensalism."

Nothing further seems to have been contributed to this peculiar relationship between crab and actinian until Mr. J. Stanley Gardiner's expedition to the Maldive Islands. In the account of the marine crustaceans of this expedition, Mr. L. A. Borradaile ('The Fauna and Geography of the Maldive and Laccadive Archipelagoes,' vol. i. pt. 3, p. 250) writes of *Melia tessellata* (text-fig. 73, p. 496) as follows:—"The crab, which lives, like *Trapezia*, among the living branches of coral stocks, holding on by its long slender legs, has for some time been known to be in the habit of carrying in each chela a small sea-anemone. The object of this habit is not known, but it is certainly a voluntary act on the part of the crab, for the actinian is not attached, but held between the fingers of the *Melia*, and, if it be taken away, will be again seized. Usually there is an anemone in each hand, but sometimes one or both hands are empty. The actinians, which are grasped firmly round the middle below the tentacles, may be useful, by means of their stinging-cells, either for defence or to 'fish' for food with, or perhaps for both purposes. The chelipeds

Text-fig. 73.



a. Melia tessellata from the Maldive and Laccadive Archipelagoes, bearing in each claw a sea-anemone; the crab is represented holding on to a living coral stock. *b.* The "hand" holding an anemone. Both enlarged. (After Borradaile.)

are slender and feeble—ill-suited for defence, but at the same time mobile and well adapted to wield the anemones they carry; and, if the crab be threatened, it will stretch out its arms towards the aggressor, as though it would ward him off with the disagreeable obstacles it thus presents to his attack. Certainly the fingers cannot be used to take food unless the anemone be first dropped; but, on the other hand, the tentacles of the latter are directed outwards, away from the mouth of the crab. The third maxillipeds are mobile, with the proximal joints rather slender and the last three stout, and are fringed with long hairs. Possibly they are used to catch small organisms for food in much the same way as those of the China Crabs (Porcellanidæ), which part with their chelipeds so readily when they are attacked, since they do not use them for taking food.

"In any case we seem to have here an interesting example of the use of an implement by an animal which, however intelligent, has at least a very differently organised nervous system from the Vertebrata. It should be noted that the case is different from that of a Spider-crab, which sticks pieces of seaweed on its back and enjoys passively the concealment gotten thereby. For the *Melia* carries the anemone in its cheliped—the chief grasping-organ of the animal, corresponding to the hand of a primate or the trunk of an elephant—and, whatever its use, it cannot be a means of passive concealment, to which its size is wholly inadequate."

These two accounts leave much to be desired ere we can be said to have a complete acquaintance with the living relationships between *Melia* and its associated actinians, and their peculiarities of habits and reactions.

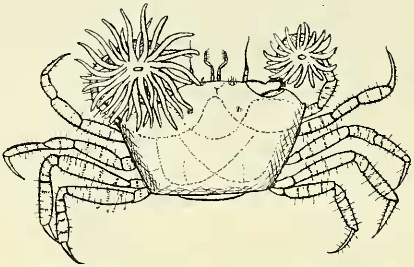
A short time ago Miss M. J. Rathburn, of the United States National Museum, forwarded me for identification the actinians held in the claws of a specimen of *Melia*. The crab had been collected at Hilo Bay, Hawaiian Islands, by Prof. Henshaw, and the actinian proved to belong to a species of *Bunodeopsis*, a genus well known as occurring in the Mediterranean and the West Indies. During a recent visit by the author to the Hawaiian Islands, under the auspices of the Carnegie Institution, for the purpose of studying the living corals, an effort was also made to procure other specimens of *Melia* and its commensal actinians. On the second day's collecting over the reef-flats at Waikiki Beach, near Honolulu, a single crab carrying actinians (text-fig. 74, p. 498) was obtained, and another a few days later. During all the subsequent collecting, extending over three months, at various points of the islands, no other Melias were seen, so that evidently the species is not so common in Hawaiian waters as in the regions visited by Möbius and Borradaile.

Both specimens of *Melia* were found on the dead under surface of coral blocks, not wandering among the branches of the living coral as in Borradaile's experience. Further, Prof. Henshaw, who has on rare occasions collected the crab at Hilo Bay, also found them on the under surface of blocks of coral. When kept in the laboratory they would sometimes come from under the corals and wander over the living polyps.

The following observations were made upon the two specimens of *Melia*, and a few notes are added upon an example of *Polydectus*—another crab obtained which likewise bears actinians in its claws.

The first *Melia* collected carried a *Bunodeopsis* in each claw. One of the actinians was fully grown, while the other was a mere fragment having two or three large tentacles and several imperfect members. The polyps were held across the column, the tentacular disc directed upwards and the aboral disc downwards; so that when at rest the crab presented the appearance depicted in fig. 74, where, however, the tentacles have been increased to their usual number. Usually the crab travelled with its claws extended a little forwards, sometimes waving them and the actinians from side to side.

Text-fig. 74.



Melia tessellata from the Hawaiian Islands, bearing an expanded actinian in each claw. When food is placed on the disc of the actinians, the first ambulatory limbs of the crab reach over and abstract it and pass it to the crab's mouth.

The actinians were grasped rather loosely, the claws of the crab being about halfway open, and with a little care it was possible to free them, though sometimes the minute spines on the inner side of the claws (text-fig. 75, p. 500) would penetrate and tear the polypal wall as described by Möbius. The claws seemed very feeble and during the operation remained open, making none of the attempts to close and grasp objects, such as one usually experiences when experimenting with crabs. The imperfect polyp was torn during its removal, a minute fragment being left on the chela; but the larger piece quickly recovered from its injuries and expanded its tentacles to their full degree.

The second *Melia* held two small sagartiids, these actinians being of an altogether different type from the *Bunodeopsis*. Both polyps were of about the same size, and were likewise held across the middle of the column in a partly expanded condition. The fact that the two specimens of *Melia* held different forms of actinians at once makes it certain that the commensalism is not restricted to a single species of actinian, as might have been supposed; moreover, the experiments given below prove that the individual crab will seize whichever of the two forms is presented to it. It may be, however, that the commensalism is limited to these two forms of actinians, *Bunodeopsis* and *Sagartia*. The figure of the actinian which Borradaile gives, reproduced on p. 496 (text-fig. 73), closely recalls the sagartiids found on the Hawaiian crabs, though he writes me that it is to be regarded as only a conventional representation. Richter's figure (p. 495, text-fig. 72) is clearly intended for a *Bunodeopsis*, and there is no reason to suppose that the form is different from the Hawaiian species.

Experiments were first conducted to determine the responses of *Melia* toward different actinians. The first crab was deprived of both its bunodeopsids and then placed in a dish in which were the two sagartiids removed from the claws of the second crab, the polyps lying free upon the bottom of the dish, not fixed by their base. The crab walked about for some time, showing no response whatever which would indicate that it was aware of the presence of the actinians; many a time it would pass in close proximity to them without any recognition signs. Happening in its wanderings to touch one of the sagartiids, it stopped immediately, moved its claws around as if examining the polyp, and then grasped it at an oblique angle and carried it away. After the crab had moved about for some time longer, with one claw occupied and the other vacant, the second sagartiid was intentionally placed so as to touch the unoccupied chela, when it was likewise examined, seized upon, and carried off.

Thus the crab which originally held two bunodeopsids had now provided itself with two sagartiids; hence the species of actinian as regards *Bunodeopsis* and *Sagartia* are interchangeable.

One of the sagartiids was now released and placed in the dish along with its original crab having both chelipeds vacant, the bunodeopsid fragment being also introduced. After a short time the *Sagartia* was seized, and later the small fragment of *Bunodeopsis*. The first *Melia* was also placed in a dish along with its own *Bunodeopsis* and a *Sagartia*, and after a time these were likewise appropriated. Thus each crab was again provided with two actinians but of different species, the one a bunodeopsid and the other a sagartiid. In all the experiments the crabs appeared to seize either one or the other species with equal readiness. Experiments as to the behaviour of the crabs towards other species of actinians were very desirable, but at the time no other forms were available.

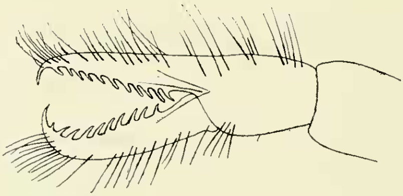
The crabs exercised what must unquestionably be considered an intelligent selection, as far as regards the desirability or otherwise of an actinian already held by them. A *Melia* carrying a small fragment of a *Bunodeopsis* in one claw and a perfect *Sagartia* in the other was placed in a dish containing the full-grown *Bunodeopsis* fixed by its base. While walking about, the crab accidentally came into contact with the large *Bunodeopsis* and stopped as if to examine it; then by means of one of its first ambulatory limbs it began working around the base of the polyp, and after a few minutes detached it. At the same time it moved the claw holding the fragment of *Bunodeopsis* towards its mouth as if to ingest the polyp, but the fragment was merely liberated and left free in the dish, and the empty claw then seized upon the larger *Bunodeopsis* which it had previously dislodged from its substratum. The *Melia* had now a perfect bunodeopsid and a sagartiid. At a later stage the large *Bunodeopsis* was removed and the previously discarded fragment introduced into the dish, when after a time the latter was appropriated.

The fragment of *Bunodeopsis* and also a *Sagartia* were again placed in a dish containing a *Melia* with both its claws unoccupied. These were taken up as soon as the crab came into contact with them, and a second perfect sagartiid was then placed in the dish. The crab with both its claws occupied came into contact with the third actinian, remained near it for some time, and then pushed it away. On returning fifteen minutes later, however, it was found that the fragment of *Bunodeopsis* had disappeared, and its place was occupied by the sagartiid; the *Melia* had detached the bunodeopsid fragment and had taken up the sagartiid in its place. There appeared to be evidence that the crab will tear a single actinian in two in order to provide each claw with a polyp.

Method of Holding and Seizing the Actinians.

Usually the actinians were held so loosely within the chelipeds of the crab that the column was but slightly constricted. As mentioned by Möbius, the joints of the chelæ are provided with very minute spines, and these no doubt assist in maintaining the polyp in position (text-fig. 75). Occasionally the body of the polyp was held in such a manner that the column was not altogether within the claws, and the wall would then be constricted and indented by the tips of the claws. In preserved specimens the polypal tissues

Text-fig. 75.



Claw of *Melia tessellata* showing the two rows of spines. Much enlarged.

are sometimes thus deeply constricted and indented, and in one instance the body of the polyp was actually pierced by the two sharp points of the claws coming together. In such cases, it is conceivable that the crab when placed in preservative fluid had closed its chelæ more firmly than usual. Under ordinary circumstances, the actinians do not seem to be in any way injured by the crab. Indeed, the polyps show no signs of their peculiar position being even one of irritation; shortly after seizure they expand to their full degree and remained in this condition, the tentacles outstretched and overhanging.

Numerous observations with the crabs deprived of the polyps lead one to suppose that the actinians are encountered only in a haphazard manner, and also that the crab makes no response to their presence until it comes into actual contact with them. When the crabs with their claws unoccupied were placed in vessels along with free polyps, they would remain still or wander around in an apparently aimless manner, even coming close to the polyps without showing any signs of recognition. When, however, the chelipeds happened to touch a polyp the crab would at once stop, move its chelæ around the polyp for a few seconds, and then open the claws and seize hold of it in almost any position, not necessarily across the column.

In their natural condition, most actinians are firmly adherent by a broad base to some substratum from which they are with difficulty dislodged; and *à priori* it is not manifest how the crabs are able to detach and carry away a polyp thus firmly fixed. Faurot*, who has studied the habits of various Hermit Crabs (*Pagurus*) and their commensal actinians, *Sagartia parasitica* and *Adamsia palliata*, finds that when a Hermit Crab attempts to remove a fixed actinian it seizes it with its maxillipeds and ambulatory limbs, and moves these about as if resisting the escape of some prey. These movements being continued bring about the retraction of the polyp, and in the end the detachment of its pedal disc from the surface of the glass or stone. Bunodeopsids and sagartiids have each adherent bases, and experiments were made to determine the manner in which they are loosened by the crustacean. After removal from the chelæ the sagartiids failed to fix themselves, but remained lying free on their sides; the large *Bunodeopsis*, on the other hand, readily fixed itself to the bottom of the glass vessel, to such a degree that it was not detached by a strong stream of water from a pipette. A *Melia* with empty claws was then introduced into the vessel. In time the crab came into touch with the fixed actinian and began, as usual, to pass its chelæ around it, but without effecting its dislodgment. Then the right member of the first pair of ambulatory appendages was brought forward, and its sharp end was applied between the polypal base and the surface of the glass, exactly in the manner one would apply one's finger in attempting to carefully separate an actinian from its attachment (text-fig. 76). The crab moved round the actinian, inserting the tip of its limb at intervals, until in the end the polyp was dislodged, when it was seized and borne away.

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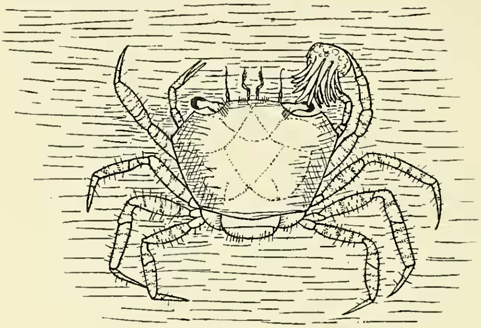
* Faurot, L.: "Etudes sur l'anatomie, l'histologie et le développement des Actinies," Arch de Zool. Exp. et Gén. 3 ser. vol. iii. p. 152.

Text-fig. 76.



Melia tessellata dislodging a fixed actinian by means of its first ambulatory limb.

The crab *Melia* has thus the remarkable power of being able to detach a sea-anemone fixed to a substratum, proceeding in absolutely the same way as would a collector in endeavouring to secure the same kind of animal. Manifestly it is only by some such method that the actinian can be freed without injury, as the chelæ, along with the other appendages, are almost useless as grasping-organs. In other instances where crabs mask themselves by hydroid, sponge, or algal growths the fragments are simply torn away by the chelipeds, but the dislodgment of an entire actinian without injury and without the use of the claws is an operation much more complex in character, whether we regard it as an instinctive or an intelligent act.

When first grasped by the crabs the sea-anemones were not necessarily held in the most favourable position, that is, across the middle of the column with the disc directed upwards; at the beginning the chelæ seized them in almost any fashion, so that the disc and tentacles were directed at an angle. In one instance, an actinian which had been thus grasped in an irregular manner was turned towards the maxillipeds and there held in position by the first ambulatory limbs; the chela was then freed from the actinian, cleansed thoroughly, and finally seized the actinian so that it was held across the middle with the disc directed upwards. There seems some evidence also that the actinians themselves institute righting reactions, such as they carry out under more natural conditions; so that, although at first grasped in any position, they are ultimately held across the middle with the oral disc and tentacles turned upwards, this being the usual relationship when first captured.

Whenever an actinian was removed from the claw of a crab, certain cleansing-operations on the part of the latter invariably took place. Ordinarily the claws have particles of débris adhering to the hairs with which they are provided, as well as to the general surface of the skeleton, the amount being undoubtedly increased by the presence of mucus from the actinian. On the chelipeds becoming unoccupied they were turned towards the mouth, and the masticatory appendages, which are richly provided with bristles and spines, at once began a series of scraping or combing movements over them. So effective were these, that within a short time the claws were altogether cleansed of any adhering foreign particles and presented a much fresher appearance.

Reactions.

Under ordinary circumstances the crab when at rest holds its two chelipeds bent towards itself, and the actinians are inclined upwards and outwards with the tentacles fully expanded, thus masking to a certain extent the anterior part of the crab. When walking the chelipeds are held more forwards, and the actinians are then presented in what can be best described as a threatening attitude. It would be impossible for any animal of moderate size to molest the crab in front without touching the polyps. Sometimes the claws are held downwards so that the polyps touch the bottom of the vessel, and on being dragged over it the mucus with which the body is covered leads to the adherence of débris.

If any part of the crab be touched in front, the reflexes are such that the chelipeds are at once extended in the direction whence the stimulus proceeds, the polyps being thereby raised and presented in a defensive attitude. Likewise when irritated from the side, both chelæ are turned laterally, the polyps again being directed towards the region whence the stimulus comes. Similarly, if touched on the upper surface of the carapace or posterior part of the body, the actinians are turned upwards and backwards: in fact, by varying the part stimulated, the chelipeds can be made to turn through about two-thirds of a circle in a vertical direction, and in addition they can perform complex lateral movements. In every case, it may be said that the responses of the crab are of such a nature that the claws bearing the actinians are turned towards the part irritated, thereby placing the polyps in a position most favourable for defence or offence. The reflexes are usually rapid and continue for some time, first in one direction and then in another, according to the region irritated. At the same time the crab generally moves away from the stimulus, backwards or forwards, though the claw reaction, the striking out, always occurs as a preliminary measure: retreat on molestation is by no means so readily resorted to as in most crabs.

It is of much importance to find that exactly the same responses to stimuli take place in a *Melia* deprived of its actinians as when they are present, but the empty chelipeds make no attempt whatever to grasp the source of irritation as in ordinary crabs. The movable joint (dactylopodite) remains partly open, to about the same degree as when holding an actinian, and its use as an organ for direct protection or attack seems to have altogether disappeared.

The responses of the chelipeds are manifestly so many instinctive reflexes on the part of the crab, directed towards the region whence the irritation comes, and are carried out independently of the presence or absence of the actinians. When the latter are in position, the reactions may be assumed to be aggressive or protective in their nature; while when taking place in the absence of the polyps they are of no protective value, as the claws are useless for grasping or seizing.

Compared with most crabs, it would seem that there is in *Melia* a marked increase in the power of directive response on the part of the chelipeds, accompanied by a loss of activity on the part of the movable joint which ordinarily serves for aggressive purposes; moreover, the chelipeds as a whole are greatly reduced in size.

Feeding Reactions.

Under ordinary circumstances, the Melias were often seen transferring towards their mouth the débris occurring on the bottom of vessels or other objects over which they passed. This they accomplished by means of the maxillipeds, with the assistance of the first, second, and even third pair of ambulatory limbs, the first ambulatory pair being the most active. The débris was seized by the maxillipeds, and the nutritive particles were ingested, and the non-nutritive rejected and wafted away posteriorly. The chelipeds, whether empty or holding actinians, took no part whatever in the feeding processes. Even fragments of meat given directly to the crab were treated in the same manner; their passage to the masticatory appendages was effected by the first ambulatory limbs, always without the assistance of the chelipeds.

As the actinians were dragged about from place to place, débris readily adhered to them by means of the viscid slime with which they were covered, and very frequently the first ambulatory limbs were applied to the polypal walls, and the latter were thoroughly cleansed from any adhering particles. The operation was carried out much in the same way as that by which the crab cleansed its own limbs. During the process the actinians were brought close to the mouth, and the débris removed was easily transferred thereto by the appendages. Some of the particles were nutritive, and there is no question that the crab will frequently secure food material thus mechanically adhering to the walls of the polyp. No instance was observed where the crab applied its appendages to the general body-surface of the polyps except when foreign particles were adherent. During the cleansing treatment the actinians remained altogether passive without even retracting; sometimes the points of the maxillipeds would penetrate the delicate flesh of the polyps and be freed only after a struggle.

By far the most unique and remarkable reactions were those observed when the actinians were supplied with food. When shreds of meat were placed on the disc of the polyp, the latter responded in the usual manner of actinians by bending its tentacles towards the disc and partly closing over the food. If the pieces were too large to be wholly covered and readily ingested, the crab seemed to be soon aware of their presence, and would then bring forward the hook of one of the first ambulatory limbs and apply it to the oral disc from time to time until all the fragments of food were removed and transferred to its own mouth. Thus the freshly broken chela of a small *Alphæus* was placed upon the oral disc of the actinian so carefully as not to touch any part of the *Melia.* Immediately the polypal tentacles closed over it preparatory to ingestion, but before the process was accomplished the first ambulatory limb of the crab reached over among the tentacles and dragged away the fragments to its own mouth.

If the fragment were sufficiently small as to rest wholly on the disc of the polyp, and the latter quickly opened its mouth to swallow it, the *Melia* might then exhibit no responses and the actinian appropriated the food. But in very few instances in a number of feeding experiments were the ingestion reactions of the actinian sufficiently rapid as to wholly indraw the food before the crab would extend an ambulatory limb and vigorously abstract it. In some instances the fragments were already partly swallowed by the polyp when the crab, receiving some stimulus, would extend an ambulatory limb to the polypal disc, and actually abstract the food from the stomodæum of the actinian and transfer it to its own mouth.

The feeding experiments were sufficient to demonstrate beyond all question that Melia actually takes away and appropriates to itself the food procured by the actinian. In the language applied to human actions, it can be truly said that the crab robs the actinian of its food, though no one would think of introducing ethical considerations into the act, even if consciousness could be established.

What are the means by which the crab is made aware of the presence of food-material on the disc of the actinian, or, rather, what determines the very definite responses of the chelipeds towards the disc of the actinians? It is certainly not a tactile reaction, for the responses took place when the food-particles could not possibly have come into contact with the crab or any of its tactile organs. It may have been that the movements of the polyp during ingestion produced some stimulus which was transmitted through the chelipeds, but ordinary stimulation of the actinian by mechanical means failed to call forth any responses on the part of the crab. It is most probable that the reaction is a result of stimulation by the meat juices emanating from the food on the disc. Fragments of meat or meat extract diffused around the anterior part of the crab called forth vigorous movements of the mouth-appendages and first pair of walking-legs, though directed towards no very definite end; but when the extract was applied towards one side or the other, there was a decided movement of the appendages in that direction. Similarly, juices emanating from the food on the polypal disc may be assumed to serve as the stimuli by which the reflexes are brought about, the source of the stimulation and direction of response being determined from the direction in which the juices reach the crab.

When non-nutritive particles, such as fragments of shell or grains of sand, were placed upon the polypal disc they produced no movements on the part of the actinian; likewise there was no response from the crustacean. Also in other cases substances which called forth no responses on the part of the actinian failed to bring about reactions from the crab. A small spider fallen into the water, and thereby drowned, was given the actinian. The tentacles closed over it momentarily, then withdrew, leaving the spider exposed on the disc. In this case the crab made no attempt to abstract the spider from the polyp, and after a time it was rejected by the latter. Fragments of bread and small pieces of paper placed on the polypal disc called forth no response from the actinian nor any from the crab. In fact, throughout the observations the actinians and crabs responded or remained indifferent to the same substances; in each case ingestion reflexes took place only towards nutritive substances from which stimulative juices might be supposed to emanate, while there was indifference or rejection towards what might be supposed to be non-nutritive substances. Where the food supplied was so small in bulk that the polyp ingested it without any attempt at abstraction on the part of the crab, we may assume that the nutritive juices were so weak that they failed to reach the sensory organs of the crab, and thereby failed to stimulate it to activity.

POLYDECTUS.

While searching among the blocks of coral rock for further examples of *Melia*, a single specimen of *Polydectus cupilifera* (Latr.) was secured, also bearing an actinian in each claw. Both in its form and behaviour the new crab presented a great contrast with *Melia*. The former is very hairy, sluggish, and irresponsive, while the latter is active and most readily responds to stimuli of all kinds.

The actinians held by *Polydectus* were small specimens of a species of *Phellia*, which occurs in abundance on the under surface of rocks and stones all round the Hawaiian Islands. Externally the polyps are characterised by having a thick cuticle over the greater part of the column, a circular area at the apex (the capitulum) alone being naked. In aquaria they are very inactive and do not readily expand.

Polydectus was under observation for only two or three days, and during most of that time it remained quiescent, hidden under fragments of coral. It allowed itself to be pushed over the floor of the vessel, making only a feeble attempt to escape, and showed little or no activity with its chelipeds. If irritated, the chelæ were not directed against the source of the stimulus as in the case of *Melia*. When the actinians were gently removed from the claws and after a time again presented, the crab made no immediate attempt to seize them. On the whole *Polydectus* proved itself to be a most unsuitable crab for experimental studies.

INTERDEPENDENCE OF CRAB AND ACTINIAN.

Enquiry may now be made as to how far the crab and its actinians are interdependent. Can the crabs maintain their existence deprived of the actinians, and can the latter exist separated from their captors? Although a careful search was made during three months' collecting, no free independent examples of either *Sagartia* or *Bunodeopsis*, the actinians commensal with *Melia*, were met with, and neither Möbius nor Borradaile speaks of finding such. There seems no reason, however, why the actinians should not be able to live separated from the crustaceans. Compared with closely allied species elsewhere, they present no modifications whatever which indicate a correlation with the commensal habit. So far as the actinians are concerned, their presence in the claws of the crab seems of the most incidental character, and it can scarcely be doubted that ordinarily they are fixed isolated species, and may yet be found as such either in the Hawaiian Islands or elsewhere. As regards *Polydectus* and its associate *Phellia*, the latter certainly exists independently of any commensalism, for all round the Hawaiian Islands specimens of the sea-anemone are very numerous, attached to the under surface of stones and coral blocks. These places also constitute the habitat of the crab. In the case of the actinians *Sagartia* and *Adamsia*, commensal with hermit crabs, Faurot has shown experimentally that the polyps do not live long when separated from their host; but the relationship on the part of the actinian is here much closer than in the polyps simply held by *Melia* and *Polydectus*. In *Sargartia palliata*, at any rate, the commensalism is correlated with a permanent modification of form.

The genus *Bunodeopsis* occurs also in the West Indian and Mediterranean seas, where it lives in shallow water loosely adherent to the leaves of the marine phanerogams *Thalassia* and *Ruppia*. In these regions, however, it is never found associated with crabs; indeed, the genus *Melia* is absent from the Atlantic. A careful comparison of the external characters and internal anatomy of the Hawaiian and West Indian species of *Buno-*

deopsis shows no important differences, and they may have to be regarded as one and the same species. Hence the commensal habit may be regarded as not essential to the life of *Bunodeopsis*, and the same can also be said of the *Sagartia* and *Phellia*.

Of all actinians, members of the genus *Bunodeopsis* would appear to be the best adapted for the rôle of commensalism. They are active polyps with long tentacles which are usually expanded to their full extent, and in the absence of a sphincter muscle the column is incapable of overfolding the tentacles. The tentacles are provided with nematocysts of several sizes, and very large stinging-cells occur in the spheroidal outgrowths on the column; and, lastly, the polyps are easily detached from any substratum to which they may be adherent. Were the commensalism of *Melia* restricted to *Bunodeopsis*, its suitability for such a relationship is so pronounced as to suggest more than a haphazard selection on the part of the crab. But when we consider that the same crab will also take up a *Sagartia*, it must be admitted that the wisdom of its selection is not so manifest; for this form retracts readily on slight irritation, does not re-expand so freely as *Bunodeopsis*, and is usually very firmly attached to its substratum. *Phellia*, so far as observations upon its activities in aquaria go, seems even less desirable than *Sagartia* for the cœnobiotic habit.

As regards the dependence of the crabs upon the actinians, the case seems much clearer. Owing to the absence of the usual junctions of the claws, the commensal habit would appear to be necessary to the existence of *Melia*. The claws, when deprived of the anemones, showed no power to grasp or seize other objects, not even when food was presented to them. The maxillipeds and ambulatory limbs transferred to the mouth any nutritive objects offered, but from their non-chelate character these appendages can be of little use in seizing or holding prey or warding off enemies. There is no question that the procuring of food by the crab itself would be very precarious were it not for the assistance of the actinians. Moreover, wherever met with, throughout its wide distribution, the crab is found to bear actinians. According to the observations of Möbius, all the specimens of *Melia* collected by him possessed polyps, though in Borradaile's experience they were sometimes absent from both claws, or from only one. It is to be expected that the crabs will occasionally lose their polyps, especially during ecdysis, and conceivably they may wander about for a time without meeting with others.

If we attempt to estimate the advantages of the commensalism to the two organisms concerned, it must be admitted that the result seems to be entirely one-sided, and in favour of the crustacean. The experiments show that the reflexes of the crab are of such a nature as to result in the removal of any food or prey which the actinian may secure. The tentacles of the polyp move about freely and seize and retain organisms coming within their reach, passing them towards the middle of the disc, from which, however, they are abstracted by the ambulatory limbs of the crab. Enemies to the crab, too large to be held by the tentacles of the polyps, may nevertheless be warned off by the stinging-cells of the anemone emitted on irritation. A careful consideration of all the circumstances justifies the view that the crab will secure much of its food through the activity of the anemones, and, further, that the latter will exercise a protective influence upon the crab against larger enemies. The advantages to the actinian appear largely negative. As Möbius suggests, the movements of the crab will serve to bring the actinian into the neighbourhood of more prey, but its chances of ultimately appropriating to itself much of this seem very small. The feeding experiments demonstrated very clearly that it is only rarely that the actinians succeed in ingesting their food ere it is withdrawn by the crab. In the case of the actinians *Sagartia* and *Adamsia*, commensal with hermit crabs, it is usually considered that the polyps secure fragments of the food torn up by the masticatory appendages and slipping away, but it is not likely that this occurs with *Melia*. Independently of the actinians, the crab can only obtain such food as may be lying upon the sea-floor and incidentally come upon the maxillipeds and the ambulatory limbs.

The acquisition of such a peculiar commensal habit on the part of two wholly distinct types of crabs, *Melia* and *Polydectus*, correlated, in the case of the former at least, with a diminutive size and partial loss of activity on the part of the chelipeds, does not admit of ready explanation. Among the activities of other crustacea there appear to be no examples which help us to understand how such behaviour and structural peculiarities have become established—no simpler or intermediate stages which suggest the lines along which the evolution has taken place. In the well-known instances of masking-crabs (*Stenorhynchus*, *Dromia*) we have the tearing away of suitable objects, such as zoophytes, algæ, and sponges, which are then affixed to the shell; but the instinctive processes involved therein are less complex than in the cases under consideration. In the latter the ordinary aggressive and tearing functions of the chelipeds are replaced by those of merely holding a living example of another group of organisms. Even the seizure by a crab of an anemone and the affixation of it upon a gastropod shell, as in the well-known hermit crabs *Pagurus*, and the actinians *Sagartia parasitica* and *Adamsia palliata*, involves much less of a departure from the usual activities of crustacea.

As in so many morphological and physiological phenomena in nature where intermediate stages are not forthcoming, it is difficult to see how such an instinct could have been acquired or evolved by slow degrees. For instance, while holding the actinians the crab could not at the same time employ its claws for the usual purpose of seizing and conveying food to its mouth. One is constrained to think of mutation as a possible explanation of commensalism of such a nature, to conceive that a similar instinct has appeared suddenly in the case of two distinct species of crab, and its possession proved favourable to the survival of the individuals. Such an explanation may suffice until it can be put to experimental test, or until extended observations on the activities and structure of animals render the theory of mutation as plausible in the animal kingdom as from De Vries's work it is among plants.

SUMMARY.

1. The commensalism between the crab *Melia tessellata* and actinian polyps is not restricted to a single species of actinians. Of two crabs captured, one carried a *Bunodeopsis* in each claw and the other a *Sagartia*.

2. As regards the same crab the two actinian species are interchangeable, and the crabs will dislodge a small polyp of one species to take up a larger polyp of another (intelligent selection).

3. Apparently the crab is not aware of the presence of an actinian until it comes into tactile connection with it. Dislodgment of a fixed actinian is brought about by the insertion of the first ambulatory limb between the polypal base and the substratum.

4. The crab travels with the actinians expanded and directed forwards, sometimes waving them from side to side. When irritated it responds by moving its chelipeds towards the source of irritation, thereby placing the actinians in what may be considered as the most favourable aggressive or defensive attitudes. The crab reacts in the same manner, whether carrying the actinians or deprived of them.

5. Food given the polyps is abstracted by the crab by means of its first pair of walking-limbs, the stimulus to activity being derived from the diffusion of the meat juices.

6. In correlation with the commensal habits the crabs have no direct use of the chelipeds as aggressive or defensive organs, or for grasping objects other than the actinians, and the functions of the first ambulatory appendages are partly modified.

7. The commensal actinians present no structural or physiological modification compared with closely allied free species elsewhere.

8. The cœnobiotic habit seems to be necessary for the existence of *Melia*, though not for that of the actinians.

9. A second species of crab, *Polydectus cupilifera*, also bears an actinian, *Phellia*, in its chelipeds; specimens of the actinian are also found adherent to stones and coral rock in the natural habitat of the crabs. Thus in all probability a similar commensal habit has been acquired independently by two wholly distinct forms of crabs.

10. The advantages of the commensalism to the crab are (1) that

it secures most of its food from the activity of the anemones in capturing small organisms, these being afterwards abstracted by the crab; (2) a possible protective influence against enemies by the ejection of stinging-cysts as a result of the irritation of the polypal tentacles. The only possible advantage to the anemone would seem to be that of being carried about by the crab, whereby it may be brought into contact with more prey, against which is the disadvantage of having much of its food abstracted by the crab.

2. Notes on a Collection of Snakes from Japan and the Loo Choo Islands. By Captain F. WALL, C.M.Z.S., Indian Medical Service.

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I am indebted to Mr. Alan Owston, of Yokohama, for the opportunity of examining a large number of Snakes collected by him in Japan and the Loo Choo Islands. Of a total of 513 specimens, 461 are Land Snakes; and the special interest of the collection lies in the extensive and representative area in which the specimens have been captured, for besides a large number obtained from Japan itself and many from all the important islands of the Loo Choo Group, examples have been obtained from the two islands, Tanega and Yaku, interposed between Japan and the Northern Loo Choos. They are distributed as follows:—

Japanese.	YEZO.		
	1. *Ancistrodon blomhoffii.*	(1)	1
	HONDO.		
	1. *Tropidonotus vibakari.*	(14)	165
	2. ,, *tigrinus.*	(53)	
	3. *Dinodon japonicus.*	(1)	
	4. *Coluber conspicillatus.*	(18)	
	5. ,, *climacophorus.*	(11)	
	6. ,, *quadrivirgatus.*	(30)	
	7. *Ancistrodon blomhoffii.*	(38)	
	TANEGA ISLAND.		
	1. *Tropidonotus tigrinus.*	(1)	3
	2. *Coluber conspicillatus.*	(1)	
	3. *Ancistrodon blomhoffii.*	(1)	
	YAKU ISLAND.		
	1. *Tropidonotus tigrinus.*	(2)	6
	2. *Coluber quadrivirgatus.*	(2)	
	3. *Ancistrodon blomhoffii.*	(1)	
	4. *Lachesis okinavensis.*	(1)	

North Loo Choos.	AMAMI.			
		1. *Tropidonotus pryeri.*	(3)	37
		2. *Dinodon semicarinatus.*	(3)	
		3. *Ablabes semicarinatus.*	(3)	
		4. *Hemibungarus japonicus.*	(4)	
		5. *Lachesis okinavensis.*	(3)	
		6. ,, *flavoviridis.*	(21)	
	OKINAWA.			
		1. *Tropidonotus pryeri.*	(54)	234
		2. *Dinodon semicarinatus.*	(19)	
		3. *Ablabes semicarinatus.*	(131)	
		4. *Hemibungarus japonicus.*	(6)	
		5. *Lachesis okinavensis.*	(4)	
		6. ,, *flavoviridis.*	(20)	
South Loo Choos.	MIYAKO.			
		1. *Dinodon rufozonatus.*	(2)	5
		2. *Lachesis mucrosquamatus.*	(3)	
	ISHIGAKI.			
		1. *Dinodon rufozonatus.*	(2)	3
		2. *Coluber schmackeri.*	(1)	
	IRIOMOTE.			
		1. *Tropidonotus pryeri.*	(1)	7
		2. *Dinodon rufozonatus.*	(4)	
		3. *Ablabes herminæ.*	(1)	
		4. *Lachesis mucrosquamatus.*	(1)	

Land Snakes	461
Sea Snakes	52
Total	513

Hitherto the Snakes from the Loo Choo Archipelago have been simply labelled "Loo Choos," with no special reference, except in a few instances, to the particular islands from which they were obtained (*vide* Boulenger, Cat. Snakes Brit. Mus. vols. i.–iii.). Thanks to the careful and methodical way in which Mr. Owston has labelled his specimens, more than a usual interest attaches to his collection, for it shows that the distribution of the species in this region is restricted to very definite zoological areas. Three such may be recognised by a glance at the above-given list:—(1) The Japanese area, with which the islands of Tanega and Yaku must be included. It will be noticed that all the species from these two islands belong to the Japanese Snake fauna except *Lachesis okinavensis*, a single specimen of which, curiously enough, was collected in Yaku. (2) The North Loo Chooan area, comprising the islands Amami and Okinawa. The six species collected in this area are peculiar to it, except *Lachesis okinavensis*, which encroaches upon the Japanese area on Yaku, and *Tropidonotus pryeri*, which extends further south into the next division. (3) The South Loo Chooan area, comprising the islands of Miyako, Iriomote, and Ishigaki. Only 15 specimens were collected in this area, including 5 species. Two of these extend to Formosa, viz., *Lachesis mucrosquamatus* and *Dinodon rufozonatus*; one is common to the whole Loo Chooan area, viz. *Tropidonotus pryeri*; and the remaining two hitherto have only been obtained from this area, viz. *Coluber schmackeri* and *Ablabes herminæ.*

Group 1. Japanese Snakes.

Family Colubridæ. Subfamily Colubrinæ.

1. Tropidonotus vibakari.—The 14 specimens were all obtained from Japan (Hondo)*. The supralabials were eight with the fourth and fifth only touching the eye in three specimens, and eight with the third, fourth, and fifth touching the eye on one side in one specimen. The anterior chin-shields touched five infralabials in one specimen. One example captured in July contained five eggs, the largest measuring $1\frac{3}{20}'' \times \frac{8}{20}''$.

2. Tropidonotus tigrinus.—Of 56 specimens, 53 were collected in Japan (Hondo), two in Yaku, and one in Tanega. The supralabials were eight with the fourth and fifth touching the eye in two, the postoculars two on one side in one. The loreal was confluent with the postnasal on both sides in three, and on one side in one. A toad had been ingested in two examples.

3. Dinodon japonicus.—A single normal specimen was obtained from Yamanashi (Hondo). The ventrals were 202 and the subcaudals 74.

4. Coluber conspicillatus.—Of 19 specimens, 18 were from Japan (Hondo) and one from Tanega Island. The temporals were two in one Hondo specimen, and the scales 23 in another Hondo specimen in the middle of the body. Ventrals and subcaudals were as follows in five specimens:—209 + 71, 203 + 64, 214 + 71, 217 + 66, 221 + 69 (the fourteenth and fifteenth subcaudals entire). The Hondo adult examples, with one exception, were uniform brown with each scale outlined darker; the belly rose or cherry-coloured, with a double series of large, rectangular, black, median spots frequently confluent across the belly; two

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* Boulenger, *op. cit.* vol. i. p. 221, mentions Formosa as a habitat for this species. If this is correct, it is a very singular circumstance. There are no other instances of Japanese species occurring in Formosa, except *Dinodon rufozonatus* and *Ancistrodon blomhoffii.* The existence of both in Formosa is easily understood, since they are common snakes on the Chinese mainland, and the Formosan Snake fauna is composed almost entirely of Chinese species. In the case of *Tropidonotus vibakari*, however, it is significant that it has not been recorded from China (except Manchuria) and it does not occur in the Loo Choos. I am prompted to regard this record as an error.

chevrons on the head, the anterior converging in front of the eyes, divergent behind to form postocular streaks, the posterior converging on the frontal, both often obscure or almost obliterated. In one the belly was sparsely spotted and in another was whitish and unspotted. The young were pinkish-brown or dove-coloured with small black dorsal spots, with an inclination to a transverse distribution; the belly whitish chequered black. One Hondo adult specimen had preserved the peculiar colouring and dorsal spots of the young, but the belly was rosy, as is usual in adults. In this specimen the scales in mid-body counted 23. The example obtained in Tanega Island was a very distinct colour-variety, singularly resembling a *Dinodon japonicus* at first sight. It was light brown with well-defined black bars, as wide as the intervals. A series of large spots in the flanks alternated with the dorsal bars. The usual head-marks were present and the belly was chequered black and white.

5. Coluber climacophorus.—All the eleven specimens were obtained from Japan (Hondo). In four specimens the scales were 25 in mid-body, in all the rest 23. The subocular was absent in one. Temporals three in one. Postoculars three on one side in two. Anterior chins touched four infralabials in two. One captured on 6th July contained 14 eggs with no trace of embryo, the largest of which measured $2'' \times 1\frac{3}{20}''$.

6. Coluber quadrivirgatus.—Of 32 examples, 30 were collected in Japan (Hondo) and two in the Island of Yaku. In one Hondo specimen the supralabials were nine with the fifth and sixth touching the eye on one side. Postoculars three on one side in one specimen. Nearly all belonged to Boulenger's Variety A*. The young were lighter in colour, with well-marked spots or cross-bars, but the longitudinal stripes faint or absent. One of the Yaku specimens belonged to Variety B, and the other was intermediate between A and B.

Family Viperidæ. Subfamily Crotalinæ.

7. Ancistrodon blomhoffii.—Of 41 specimens, 39 were from Japan (Hondo 38, Yezo 1), one from Tanega Island, and one from Yaku Island †. In only one Hondo specimen were the scales 23 in the middle of the body, but this number was present in both the specimens from Tanega and Yaku. The ventrals and subcaudals in the Yaku example were 143 + 53, and in the Tanega example the ventrals were 142. One had eaten a frog. One captured on the 27th June contained three immature eggs with no trace of embryo.

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* *Op. cit.* vol. ii. p. 60.

† It is doubtful whether the specimen in the British Museum labelled Okinawa (Boulenger, *op. cit.* vol. iii. p. 526) is correctly recorded. It appears to be the only specimen reported from the Loo Choo Group of islands, where it is singularly out of place. Tsu Sima is an island in the Corean Strait, and not in the Loo Choos as stated by Boulenger on the same page.